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ON THE FLORA OF CUTCH.

BY

E. BLATTER, S.J.

PART I.

The flora of Cutch has received very little attention on the part of botanical explorers. There is scarcely any other part in India that is so seldom mentioned in floristic works as Cutch. Much less are we able to find any special publication on its vegetation. When Hooker and Thomson published their "*Flora Indica*" in 1855, they gave us in the "Introductory Essay" a valuable account of the physical and botanical features of the various parts of India, but regarding Cutch we read only the following remarks: "The district of Kach, which is separated from Katiwar by the Gulf of Kach, a narrow arm of the sea, from Sindh by the most eastern branch of the Indus, and from Marwar by the Rann (a very singular saline and more or less marshy plain, in which the river Luni loses itself) has a very similar climate to the peninsula of Gujarat, being like that traversed by a range of hills running from West to East. It may, therefore, (for our purposes) with more propriety be considered a part of Gujarat, than to belong to Sindh, to which physically as well as politically it is more nearly related. The northern districts of both Kach and Katiwar, being screened from the rain-bringing winds by the hills, are extremely arid."¹ Since the time when this was written, the countries surrounding Cutch have been explored more minutely as regards their flora, and the physical and meteorological conditions prevailing in them are better known. This will enable us later on to decide the question whether Cutch ought to be considered a part of the botanical province of Gujarat or of Sind. The last 50 years did not add much to our knowledge of the flora of Cutch. Here we are speaking of the printed records only, for we are not so fortunate as to have access to the extensive herbaria of Europe which very likely contain specimens also of Cutch. Of the former only one came under our notice. It is a list of the plants of Cutch, prepared by Colonel G. T. Palin as a contribution to Vol. V. of the Bombay Gazetteer in 1880. The circumstance that the habitat and flowering time is added to the names of many species make the catalogue a very valuable

¹ Hooker, J. D., and Thomson, T., *Flora Indica*, Vol. I., p. 150.



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one. It was just the fact, on the one hand, that the flora of Cutch is very incompletely known and, on the other, that Cutch occupies an almost isolated position, that induced me in December last, to pay a visit to that out-of-the-way country. If I am now able to add something to our previous knowledge of the Botany of Cutch, it is greatly due to the untiring efforts of my companion, the Rev. H. Sierp, s.j., Professor of Chemistry, who, with valuable suggestions and practical aid, was a great help to me throughout the whole journey.

As the physical aspects and meteorological conditions of a country determine the special character and development of its vegetation, it is advisable to give first a short sketch of the territory of Cutch. I consider this less superfluous because comparatively very few are personally acquainted with Cutch, and if others try to form an idea as to its physical configuration, I am afraid, the picture they draw of Cutch will not be accurate, not to say incorrect, if I am allowed to draw a conclusion from my own experiences.

The Province of Cutch extends from $20^{\circ} 47'$ to 24° N. Lat., and $68^{\circ} 26'$ to $71^{\circ} 10'$ E. Long., being crossed by the parallel of the tropic of cancer about 14 miles north of the capital, Bhuj. On the north, east, and south-east it is bounded by the Rann; on the south by the Gulf of Cutch, on the west by the Arabian Sea, and on the north-west by the eastern branch of the Indus. Its extreme length from east to west is 160 miles and its extreme breadth 70 from north to south, while in one place it is only 35 miles wide. It contains about 6,500 square miles, exclusive of the Grand Rann, which, including the islands with the portion bounded by the Gujarat Coast in the east and south-east covers an area of 10,000 square miles. Perhaps the most striking feature to the visitor of Cutch is the sterility of the country. Sandy plains and naked rocky hills present a strong contrast to the more fertile parts of India. The barrenness is increased by the scarcity of trees and general absence of anything that can be called jungle. "From the sea on the south and west, and from the Rann on the north and east, the coast of Cutch is in some places very slightly raised and fringed with mangrove swamps. In other parts it rises in rows of sand hills, or as in the north-west, in broken rocky cliffs. Inland, especially on the south and east, are broad plains, some deep soiled and well tilled, others bare and furrowed with water-courses. Beyond these plains rise the central lands of the province, in places

relieved by bright coloured rocks and patches of tillage, but over most of the area brown waving uplands deep in loose sand, broken by naked peaks, and bordered by bare ridges of low dust-coloured hills."¹ Yet parts of the country are far from being unpicturesque. Though none of the elevations of Cutch are very great, being generally under 1,500 feet above the sea, its hills form one of the chief natural features of the Province. Three distinct ranges of hills are traceable in Cutch proper having an easterly and westerly direction. The most northern range overlooks the Rann from near Lukput to a point about 28 miles eastward of Bhuj. It forms an irregular chain, and, for the greater part, presents to the north a perpendicular cliff, and to the south an inclined plain. The next called the Charwar range, passes transversely through the centre of the Province, and is connected with the former, at its north-western extremity, by a cluster of hills. It is made up, partly of sandstone, and partly of a series of strata of slate clay, limestone, slate, and slaty limestone. The third, or southern range, called the Dora hills, has the same general direction as the other two, but is of smaller extent and consists entirely of volcanic materials. A number of isolated volcanic hills are also scattered over the plain, as well as in other parts of the Province, particularly on the borders of the Rann, where is situated the hill Dhinodbar, the highest in Cutch (1 073 feet). The Vagad hills in the eastern part of the district are a broad group stretching east and west. They have many separate peaks, the principal of which is the Vittroe. A disconnected chain traverses the Rann islands of Pacham, Kurree, Bela, and Chorar from west to east. The most lofty summit occurs at Pacham Peer, rising 1 437 feet above the Rann. The varied and vivid colouring of the rocks add a peculiar charm to the aspect of the country. The three primary colours with many varieties of their compounds are represented by the rocks as well as their atmospheric debris. "Owing to the oxides of iron, red and yellow prevail; but in some places these are mixed with pale lavender, blue and purple tints, and contrasted with intense black or the purest white; and when any vegetation adds some green, the brilliancy of the effect becomes very striking. As a rule, the country has warm sienna tints, with red, purple or black rocks nearly always close at hand; while the grey, purple or orange hills

¹ Bombay Gazetteer, Vol. v., p. 2.

are often varied by patches of white strongly relieved against the adjacent sombre colour of some mass of intrusive or overlying trap."¹

There are no rivers that have water enough to flow throughout the year. The river courses are merely channels for conveying the periodical floods from the central uplands to the sea and Rann respectively. The Khari, which rises in the Chorad hills, about eight miles south-west of Bhuj, has a course of about 30 miles. Flowing past Bhuj and winding its way between steep banks in places 110 feet high, it keeps north and loses itself in the Rann. The largest rivers that have a southern direction are the Madh and the Tera. They flow for about 30 miles across the Abdasa plain and fall together into the Gulf of Cutch. Owing to the fact that almost all the rocks are impregnated with salts, the water of the Cutch streams is unfit to drink, and during the hot season is too salt even for cattle. This circumstance has to do a great deal with the character of the present flora. Water is usually found at no great depth from the surface. Many wells being 15 to 45 feet deep yield sufficient supplies. The ponds, which are not uncommon, are mostly small and usually run dry in six months.²

As to the climate of Cutch we have to rely almost entirely on general and insufficient data scattered here and there in various descriptions of that Province³. Being situated along the north parallel of the tropic of Cancer, Cutch is very little subjected to the rain-bringing influence of the south-west monsoon. Though heavy monsoon rains are experienced on the western shores and side of India far to the north of Ahmedabad, they seem to neglect the southern parts of Sind and Kattiawar. The 21 years preceding 1869

¹ Memoirs of the Geological Survey of India, vol. IX., p. 14.

² For further information regarding the physical geography of Cutch we refer to—

MacIverdo, J.—An account of the province of Kutch and of the countries lying between Guzerat and the Indus in "Transactions of the Literary Society of Bombay, Vol. II." 1820.

Grant, C. W.—Memoirs to illustrate a geological map of Kutch in "Geological Papers on Western India" by Carter, 1837.

Raikes, S. N.—Memoir on the Kutch State, 1854.

Records of the Geological Survey of India, Vol. II, parts 2 and 3, 1869.

Wynne, A. B.—Memoir on the Geology of Cutch in "Memoirs of the Geological Survey of India," Vol. IX, 1872.

³ cf. Raikes, S. N., l. c.

Raikes, S. N.—Brief notes relative to the Kutch State, 1854.

Barnes, J.—General remarks on the medical topography of Dhooj, 1828.

Wynne, A. B., l. c.

Bombay Gazetteer, Vol. V.

show an average annual rainfall of 14·30 inches at Bhuj, the maximum registered being 31·88 inches in 1862, and the minimum 1·10 in 1848. The rain generally reaches Cutch from directions opposite to that of the prevailing winds, in the form of squalls from the north-north-west round by north and east, to south. The south-west monsoon winds are very strong from June to October, the weather being seldom calm. In the cold months harsh east and north winds prevail, succeeded by strong south-westerly gales and steady winds, the air being frequently loaded with dust. The months of April and May are very hot inland, while along the coast the climate is delightful, from the absence of the burning winds and dust storms that prevail elsewhere during those months. In June the hot winds generally cease: the atmosphere becomes cloudy: and occasionally the rains, which commence very irregularly, are preceded by excessive sultriness. During the rains the climate is usually most agreeable; cloudy and cool, with a cool breeze night and day. The cold weather sets in later in Cutch than in Gujarat. The sun during the first half of November is oppressively hot: December is cold; and January colder. In this month ice is occasionally produced. In March, again, the sun begins to strike hot.

Through the kindness of Dr. P. J. Figueredo, who is in charge of the meteorological station at Bhuj, I am able to give a few tables regarding the rainfall and temperature in that place. We can only regret that similar observations are not made in other places of the province, as it is very probable that distinct differences exist in the plains north and south of the hill ranges. The differences will, however, not be very great, and the subjoined data are likely to give a fair idea of the climate of the whole of Cutch.

Bhuj Rainfall, 1904-1907, at N. Lat. $23^{\circ}15'$, and E. Long. $69^{\circ}49'$.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
1904	0·14	..	0·62	..	..	..	1·67	0·28	2·17	..	0·4	..	5·11
1905	0·16	..	..	0·03	..	..	4·76	0·82	0·72	..	..	..	6·43
1906	0·09	1·44	..	..	..	4·43	4·68	2·33	2·48	1·60	..	..	17·95
1907	..	1·17	..	0·01	..	2·90	5·41	6·07	0·17	..	..	..	13·73

Bluej Thermometer Readings in 1904, showing the Mean Monthly Maxima and Minima with Mean Daily Range.

January.			February.			March.			April.			May.			June.		
Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.
75	54	25	86	53	27	89	65	24	100	70	30	101	71	30	96	8	24

July.			August.			September.			October.			November.			December.		
Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.	Maximum.	Minimum.	Daily Range.
90	77	13	92	74	18	93	74	19	97	73	24	90	68	22	82	65	17

Of the two factors, rain and temperature, the latter seems to exercise very little modifying influence upon the seasons in the vegetative and sexual life of the plants. It is mainly the water that awakens the slumbering seeds from their dry and apparently lifeless grave; and if the country is barren and devoid of forests and jungle, we shall find the cause of it in the want of rain. This becomes evident from the fact that, when even a little rain falls, grasses and herbs quickly spring up, and that plains and hills rapidly change colour, especially in the trapean area. If cloudy weather follows, sufficient pasture is obtained for the herds upon which the inhabitants mainly depend for their subsistence. On the other hand, in ordinary dry seasons the plains resemble deserts. Heavy sand is drifted over them by the wind often into forms imitating the dunes of sea coasts, and the country seems to afford nourishment to little besides numbers of prickly *Euphorbias*. In cases where the rains are so partial that large tracts receive but a few scanty showers for several years in succession, the country becomes all but uninhabited, the people with their flocks being forced to look out for subsistence on the irrigated lands of Sind or elsewhere.

The soil of Cutch is, generally speaking, a light clay, covered with a coarse sand from one to four and six inches deep. Six or eight feet

below the surface, in many places is found a clay of perfectly white colour like lime, and in others we meet with a strong tough yellow clay mixed with small stones. In the former water is said to be found most abundant, but not of the best quality; and in the latter, water of an excellent quality is generally got by penetrating through a thin bed of rock lying beneath it. In some of the plains near the hills excellent water is found by cutting through a sandstone which often lies within four feet of the surface; and in other plains wells have been sunk sixty or seventy feet deep without meeting with either water or stone of any kind. In Vagad the soil is more loamy than in any other part of Cutch; and in many instances under the hills throughout the province we meet with a rich soil thickly covered with a coarse kind of gravel, which seems in some way or other to aid vegetation. Extensive salt wastes, which are not uncommon, are frequently encrusted with a saline covering, and yield no vegetation.

The following list contains the indigenous plants as well as those commonly cultivated. No mention is made of the numerous species introduced into the splendid gardens of H. H. the Rao of Cutch and of the Political Agent residing in Bhuj. The geographical distribution¹ has been added to each species in order to facilitate the formation of a general idea as to the origin and composition of the flora and its present relations to the vegetation of the neighbouring countries.

In this place I should like to express my sincerest thanks to H. H. the Rao of Cutch, to Col. Abud, the Political Agent, to the Dewan Sahib, Mr. Chunilal Sarabhai, and to Mr. R. H. Kotwal, the Commissioner of Police, for the kind assistance they gave us throughout our stay in Cutch.

1. *Magnoliaceæ*—

- (1) *Michelia champaca*, L.—Cultivated: flowers: Apr.-Sept.—Java.

2. *Anonaceæ*—

- (2) *Polyalthia longifolia*, Benth and Hook.—Not indigenous; flowers Apr.-May—Ceylon.

- (3) *Anona squamosa*, L.—Cultivated.—West Indies.

- (4) *Anona reticulata*, L.—Cultivated.—West Indies.

3. *Menispermaceæ*—

- (5) *Tinospora cordifolia*, Miers—Konkan, Deccan, S. M. Country.

¹ The respective notes have been gathered from the more recent floristic works on Indian plants, especially Th. Cooke and J. D. Hooker.

- (6) *Cocculus villosus*, DC.—Not common; flowers: Dec.—Gujarat, Deccan, Konkan.
- (7) *Cocculus laeba*, DC.—Rare; flowers: Nov.-Dec.—Sind, Gujarat—Afghanistan, Arabia, Africa.
- (8) *Stephania bernandifolia*, Walp.—Rare—Deccan, Konkan, Kanara—Malaya, Tropical Africa and Australia.
- 4. *Nymphaeaceae*—
 - (9) *Nymphaea lotus*, L.—Very rare; cultivated in the Bombay Presidency—Africa, Hungary, Java, Philippines.
 - (10) *Nymphaea stellata*, Willd.—Rare; cultivated in the Bombay Presidency—Africa.
- 5. *Fumariaceae*—
 - (11) *Fumaria parviflora*, Lam.—In cultivated fields; flowers: Dec.-Jan.—Sind, Deccan.
- 6. *Cruciferae*—
 - (12) *Farsetia jacquemontii*, Hook. f. and Thoms.—Pretty common; flowers: Dec.—Sind, N. India—Afghanistan, Beluchistan.
 - (13) *Moricandia tortuosa*, Hook. f. and Thoms.—Rare; flowers: Dec.—Sind.
- 7. *Capparidaceae*—
 - (14) *Cleome monophylla*, L.—Rare; flowers: Nov.-Dec.—Gujarat, Deccan, S. M. Country—Tropical Africa.
 - (15) *Cleome papillosa*, Steud.—Flowers: August-Dec.—Sind—Arabia, Abyssinia, Nubia, Kordofan.
 - (16) *Cleome stocksiana*, Boiss.—Flowers: Oct.-Nov.—Sind—Beluchistan.
 - (17) *Cleome brachycarpa*, Vahl.—Flowers: Nov.-May.—Sind—Arabia, N. Africa.
 - (18) *Gynandropsis pentaphylla*, DC.—Common in waste places; flowers: June-Sept.—Gujarat, Deccan, S. M. Country.
 - (19) *Mærua ovalifolia*, Cambess.—Rare, in hedges; flowers: Nov.-March.—Gujarat, Deccan, Konkan, S. M. Country.
 - (20) *Cadaba indica*, Lam.—Rare, in hedges; flowers: Nov.-March.—Gujarat, Deccan, Konkan, S. M. Country.
 - (21) *Capparis spinosa*, L.—Not common; flowers: Dec.-March.—Sind, Deccan, Konkan—N. Africa, Mediterranean region of Europe, Australia.
 - (22) *Capparis spinosa*, L., var. *galeata*, Hook. f. and Thoms.—Sind.—Arabia, E. Africa.
 - (23) *Capparis aphylla*, Roth.—Very common; flowers: Feb.-March.—Sind, Gujarat, Deccan—Arabia, N. Tropical Africa, Egypt.
 - (24) *Capparis sepiaria*, L.—Rare; flowers: Feb.-March.—Deccan, Kanara.
 - (25) *Capparis horrida*, L. f.—Not common; flowers: Nov.-Apr.—Sind, Deccan, Konkan, S. M. Country.

8. *Resedaceæ*—
 - (26) *Reseda pruinosa*, Delile.—Rare.—Flowers: March.—Sind.
 - (27) *Reseda anchora*, Boiss.—Rare.—Sind.
9. *Violaceæ*—
 - (28) *Viola stocksii*, Boiss.—Flowers: July-August.—Sind, Gujarat—Beluchistan, Afghanistan.
10. *Polygalaceæ*—
 - (29) *Polygala eriopetra*, DC.—On dry cultivated ground.—Sind, Gujarat—Deccan, Konkan—Tropical Asia and Africa.
 - (30) *Polygala elongata*, Klein.—On sandy cultivated ground: flowers: Aug.-Dec.—Konkan, Kanara, S. M. Country.
 - (31) *Polygala irregularis*, Boiss.—On sandy tilled soil: flowers: Dec.—Sind, Gujarat—Beluchistan, Arabia, Kordofan.
11. *Caryophyllaceæ*—
 - (32) *Polycarpæa corymbosa*, Lam.—On sandy ground; flowers: Nov.-Feb.—Sind, Deccan, Konkan, S. M. Country—Tropical Asia, Africa, America, Australia.
 - (33) *Polycarpæa spicata*, Wight.—On sandy soil; flowers: Nov.-Feb.—Sind, Gujarat—Arabia, Abyssinia, Egypt.
12. *Portulacaceæ*—
 - (34) *Portulaca oleracea*, L.—A pretty common weed; flowers: Sept.-Jan.—Throughout the Presidency.
 - (35) *Portulaca quadrifida*, L.—Common; flowers: Sept.-Jan.—Sind, Deccan, S. M. Country.
 - (36) *Portulaca taberosa*, Roxb.—On sandy soil, less common than the foregoing species; flowers: Aug.-Sept.—Sind.
13. *Tamaricaceæ*—
 - (37) *Tamarix dioica*, Roxb.—In river beds; flowers: Nov.-Dec.—Throughout the Presidency—Afghanistan, Assam, Borneo.
 - (38) *Tamarix ericoides*, Rottl.—Rarer than *T. dioica*; flowers: Nov.-Jan.—Sind, Gujarat, Deccan, Konkan, Kanara.
14. *Elatinaceæ*—
 - (39) *Bergia odorata*, Edgew.—Flowers: Oct.-Dec.—Sind, Gujarat.
15. *Malvaceæ*—
 - (40) *Althæa ludwigii*, L.—Sind, Deccan—W. Asia, Mediterranean region, S. Africa.
 - (41) *Malva parviflora*, L.—About human habitations: flowers: Dec.-Feb.—Sind, Deccan—W. Asia, N. Africa, Europe.
 - (42) *Sida veronicifolia*, Lam.—Very common on sandy soil: flowers: Oct.-Dec.—Sind, Gujarat, Konkan, S. M. Country.—Tropical and subtropical regions of the world.
 - (43) *Sida spinosa*, L.—Flowers: Oct.-Dec.—Sind, Gujarat, Deccan, Konkan—Tropical and subtropical regions of the world.

- (44) *Sida rhombifolia*, var. *retusa*, Masters.—Very common : flowers Oct.-Jan.—Gujarat, Deccan, Konkan, S. M. Country.
- (45) *Abutilon indicum*, Sweet.—Very common : flowers : Oct.-Jan.—Sind, Deccan, Konkan, S. M. Country.
- (46) *Abutilon muticum*, Sweet.—Common : flowers : Sept.-Jan.—Throughout the Presidency.
- (47) *Abutilon graveolens*, W. & A.—Not common : flowers : Nov.-Jan.—Sind—From tropical Africa to Queensland.
- (48) *Malachra capitata*, L.—Flowers : Sept.-Dec.—Naturalized in many places in India.
- (49) *Urena sinuata*, L.—Flowers : Oct.-Dec.—Gujarat, Deccan, S. M. Country.—All tropical regions.
- (50) *Pavonia glechomifolia*, Garcke.—In sheltered places, under hedges and bushes : flowers : Sept.-Oct.—Sind, Gujarat—Arabia, Tropical Africa.
- (51) *Pavonia zeylanica*, Cav.—Common : flowers : Sept.-Jan.—Sind, Gujarat, Deccan—Tropical Africa, Mauritius, Ceylon.
- (52) *Pavonia odorata*, Willd.—Common : flowers : Sept.-Jan.—Konkan, S. M. Country—Tropical Africa, Ceylon.
- (53) *Hibiscus trionum*, L.—Flowers : Sept.-Jan.—Sind, Deccan, Konkan—Southern Europe, Tropics of the Old World.
- (54) *Hibiscus micranthus*, L.—Common : flowers : Oct.-Nov.—Sind, Gujarat, Deccan, Konkan, S. M. Country—Tropical Africa, Ceylon.
- (55) *Hibiscus intermedius*, A. Rich.—Common : flowers : Aug.-Oct.—Sind, Gujarat—Arabia, Tropical Africa.
- (56) *Hibiscus solandra*, L'Hér.—Flowers : Oct.-Dec.—Gujarat, Konkan, S. M. Country.—Asia, tropical Africa.
- (57) *Hibiscus casius*, Garcke.—Flowers : Oct.-Nov.—Deccan—Afghanistan, N. Australia, S. Africa.
- (58) *Hibiscus punctatus*, Dalz.—Flowers : Sept.-Jan.
- (59) *Hibiscus esculentus*, L.—Cultivated.
- (60) *Thespesia populnea*, Poland.—Not wild : flowers : Nov.-Jan.
- (61) *Gossypium stocksii*, Mast.—Flowers : Dec.-Jan.—Sind.
- (62) *Gossypium herbaceum*, L. var.
- (63) *Gossypium arboreum*, L.
16. *Sterculiaceæ*.—
- (64) *Melhania tomentosa*, Stocks.—Gujarat, Sind.
- (64a.) *Waltheria indica*, L.—Not common : flowers : Sept.-Oct.—Deccan, S. M. Country.—Warmer regions of the world.
17. *Tiliacæ*.—
- (65) *Grewia populifolia*, Vahl.—Common : flowers : Sept.-Nov.—Sind, S. M. Country—Beluchistan, Afghanistan, S. Persia, Arabia, Tropical Africa, Mauritius, Ceylon.
- (66) *Grewia villosa*, Willd.—Common—Sind, Gujarat, Deccan, Konkan.

- (67) *Triumfetta rhomboidea*, Jacquin.—Common ; flowers : Sept.-Jan.—Deccan, Konkan, S. M. Country, Kanara—China, Malaya, Tropical Africa.
- (68) *Triumfetta rotundifolia*, Lam.—Common ; flowers : Aug.-Sept.—Gujarat, Deccan, Konkan.
- (69) *Corchorus olitorius*, L.—Common ; flowers : Sept.—Sind, Gujarat Deccan, Konkan, S. M. Country—All tropical regions.
- (70) *Corchorus antichorus*, Raensch.—Common ; flowers : Sept.-Nov.—Sind, Gujarat, Deccan—Afghanistan, Arabia, Tropical Africa, Cape de Verde Islands.
- (71) *Corchorus acutangulus*, Lam.—Flowers : Sept.-Oct.—Sind, Gujarat, Konkan—Ceylon.
18. *Malpighiaceæ*—
- (72) *Hiptage madablota*, Gaertn.¹—Deccan, Konkan, Kanara—Ceylon, Java, China.
19. *Zygophyllaceæ*.—
- (73) *Tribulus terrestris*, L.—Common ; flowers : Aug.-Oct.—Sind, Gujarat, Deccan, S. M. Country.
- (74) *Tribulus alatus*, Delile.—Flowers : Oct.-Dec.—Sind—Arabia, N. Africa.
- (75) *Seetzenia orientalis*, Dene.—Sind—Arabia, Africa.
- (76) *Peganum harmala*, L.—Flowers : Nov.-Dec.—Sind, Deccan, Konkan—Soongaria, Arabia, N. Africa, Hungary, Spain.
- (77) *Zygophyllum simplex*, L.—Flowers : Nov.-Jan.—Sind—Arabia, Western Asia, Tropical Africa.
- (78) *Fagonia cretica*, L.—Very common : flowers : Oct.-Jan.—Sind, Deccan.
20. *Geraniaceæ*.—
- (79) *Monsonia senegalensis*, Guill.—Pretty common ; flowers : Aug.-Oct.—Sind, Gujarat, Deccan—Beluchistan, Arabia, Senegambia.
- (80) *Oxalis corniculata*, L.—Flowers : Oct.-June—Cosmopolitan.
21. *Rutaceæ*—
- (81) *Murraya koenigii*, Spreng.—In gardens—Deccan, Konkan, Kanara, S. M. Country—Ceylon.
- (82) *Citrus medica*, L., var. *medica*. Citron.—In gardens.
- (83) „ „ L., var. *limetta*, Sweet Lime.—In gardens.
- (84) „ „ L., var. *acida*, Sour Lime.—In gardens.
- (85) *Citrus aurantium*, L.—Orange. In gardens.
- (86) *Citrus decumana*, Murr.—Pammelo. In gardens.
- (87) *Foronia elephantum*, Corr.—In gardens—Java, Ceylon.
22. *Simarubaceæ*—
- (88) *Balanites roxburghii*, Planch.—Common ; flowers : March-May—Gujarat, Deccan, Konkan, S. M. Country—Drier parts of India.

1. I have not seen this plant ; I give it on the authority of Murrey.

23. *Burseraceæ*.—

- (89) *Commiphora mukul*, Engl.—Pretty common on rocky ground : flowers : Dec.-April.—Sind, Deccan, Rajputana, Arabia, Beluchistan.

24. *Meliaceæ*.—

- (90) *Melia azedarach*, L.—In gardens—Persia, China.
(91) *Azadirachta indica*, A. Juss.—In gardens.

25. *Celastraceæ*.—

- (92) *Gymnosporia montana*, Benth.—On rocky ground, not common ; flowers : Oct.-Nov.—Sind, Gujarat, Deccan, Konkan, Kanara—Central, South-western and North-western parts of India, Afghanistan, Central Africa, Malaya, Australia.

26. *Rhamnaceæ*.—

- (93) *Zizyphus jujuba*, Lamk.—Very common : flowers : Sept.-Oct.—Throughout India.—Afghanistan, Ceylon, China, Australia, Africa.
(94) *Zizyphus roundifolia*, Lamk.—Not common ; flowers : Sept.-Oct.—Gujarat, S. M. Country, Punjab, Western Peninsula, Persia.
(95) *Zizyphus oenopia*, Mill.—Not common ; flowers : Sept.-Oct.—Deccan, Konkan, Kanara, S. M. Country—Hotter parts of India, Tropical Asia, Australia.

27. *Vitaceæ*.—

- (96) *Vitis trifolia*, L.—Not common ; flowers : Aug.—Deccan, Konkan, Kanara, S. M. Country—throughout India, Ceylon, Malacca.

28. *Sapindaceæ*.—

- (97) *Sapindus laurifolius*, Vahl.—Cultivated ; flowers : Oct.-Dec.—Indigenous in N. Kanara.

29. *Anacardiaceæ*.—

- (98) *Rhus mysorensis*, Heyne.—Not common, on stony dry slopes ; flowers : June-July—Sind, Deccan, S. M. Country—Throughout India.
(99) *Mangifera indica*, L.—Cultivated ; flowers : Jan.-March.

30. *Moringaceæ*.—

- (100) *Moringa pterygosperma*, Gaertn.—Cultivated, near villages in tilled soil—Indigenous on the W. Himalaya and in Oudh.

31. *Leguminosæ*.—

- (101) *Crotalaria burhia*, Ham.—Common in sandy places ; flowers : Dec. Feb.—Sind, Gujarat—N. W. India, Afghanistan, Beluchistan.
(102) *Crotalaria retusa*, L.—Common ; flowers : Sep.-Jan.—Deccan, Konkan, S. M. Country—Throughout India, Ceylon, China, Malaya, N. Australia, Tropical Africa.
(103) *Crotalaria juncea*, L.—Common ; flowers : Aug.-Jan.—Malay Islands, Australia.

- (104) *Crotalaria medicaginea*, Lam., var. *neglecta*, Baker.—Sind, Gujarat, Konkan—Tropical India, Ceylon, Malaya, Afghanistan, China, Australia.
- (105) *Crotalaria notonii*, W. and A.—On sandy soil—Gujarat, Nilghiri and Pulney Hills.
- (106) *Melilotus indica*, All.—Sind, Deccan—Tropical India, Europe, S. Persia, Afghanistan.
- (107) *Medicago sativa*, L.—Cultivated.
- (108) *Lotus garcini*, DC.—Flowers: Nov.-Dec.—Sind, Gujarat—Persia, Nubia.
- (109) *Indigofera linifolia*, Retz.—Common; flowers: Aug.-Dec.—Deccan, Konkan, S. M. Country—Throughout India, Ceylon, Afghanistan, Abyssinia, N. Australia.
- (110) *Indigofera enneaphylla*, L.—Common; flowers: Aug.-Dec.—Gujarat, Deccan, Konkan, S. M. Country—Plains of India, Ceylon, Angola, Malay Islands, N. Australia.
- (111) *Indigofera anabaptista*, Steud.—Flowers: Aug.-Nov.—Sind—Punjab, Afghanistan, Arabia.
- (112) *Indigofera paucifolia*, Delile.—Common; flowers: All the year—Gujarat, Sind—Plains of India, Ceylon, Beluchistan, Arabia, Java, Tropical Africa.
- (113) *Indigofera trifoliata*, L.—Not common; flowers: Sept.-Nov.—Gujarat, Deccan, S. M. Country, Konkan—Throughout India, Ceylon, Java, China, Philippines, N. Australia.
- (114) *Indigofera articulata*, Goëan.—Flowers: Nov.-Dec.—Sind, Deccan—Arabia, Egypt, Abyssinia.
- (115) *Indigofera tenuifolia*, Rottl.—Flowers: Oct.-Nov.—Sind, Gujarat, S. M. Country, Konkan—Western Peninsula, Ceylon.
- (116) *Indigofera parviflora*, Heyne.—Rare; flowers: Nov.-Dec.—Konkan, S. M. Country—Western Peninsula, Carnatic, Arabia, Tropical Africa, N. Australia.
- (117) *Indigofera tinctoria*, L.—Not common; flowers: Sept.-Dec.
- (118) *Indigofera hirsuta*, L.—Not common; flowers: Sept.-Dec.—Konkan, S. M. Country—Plains of India—Ceylon, Tropical Africa and America, Java, Philippines, N. Australia.
- (119) *Tephrosia tenuis*, Wall.—Flowers: Sept.-Nov.—Sind, Deccan, Konkan, S. M. Country—Punjab, Burma, Laccadives.
- (120) *Tephrosia purpurea*, Pers.—In sandy places; flowers: Sept.-Dec.—Gujarat, Deccan, Konkan, S. M. Country.
- (121) *Tephrosia villosa*, Pers.—var. *incana*, Baker; Common in sandy places; flowers: Sept.-Dec.—Gujarat, S. M. Country.
- (122) *Tephrosia scuticosa*, Pers.—In sandy places; flowers: Sept.-Dec.—Deccan, Konkan, Western Peninsula—Burma, Ceylon.
- (123) *Sesbania aegyptiaca*, Poir. var. *bicolor*, W. and A.—Flowers: Sept.-Dec.

- (124) *Sesbania aculeata*, Poir.—Very common; flowers: Aug.-Oct.—Konkan, Deccan—Tropics of the Old World.
- (125) *Taverniera nummularia*, DC.—Flowers: Dec.—Sind, Gujarat, Deccan—Punjab, Afghanistan.
- (126) *Alhagi camelorum*, Fisch.—Not common; flowers: March.—Sind, Gujarat, S. M. Country, N. and N.-W. Provinces—Beluchistan, Egypt, Arabia.
- (127) *Zornia diphylla*, Pers.—Very common; flowers: Aug.-Oct.—Deccan, S. M. Country.
- (128) *Alysicarpus vaginalis*, DC. flowers: Oct.-Nov.—Gujarat, Deccan, Konkan, throughout India—Ceylon, Afghanistan, Tropics of the Old World.
- (129) *Alysicarpus longifolius*, W. and A.—flowers: Sept.—Gujarat, Deccan, Konkan, Plains of India.
- (130) *Alysicarpus rugosus*, DC. var. *styracifolius*, Baker—Sind, Gujarat, Konkan, throughout India—Ceylon.
- (131) *Abrus precatorius*, L.—Not common; flowers: Sept.-Oct.—Gujarat, Deccan, Konkan, Kanara.—India, Ceylon, throughout the Tropics.
- (132) *Butea frondosa*, Koenig.—Rare; flowers: Feb.-March.—Gujarat, Deccan, Konkan—India, Ceylon.
- (133) *Phaseolus trilobus*, Ait.—Flowers: Oct.-Nov.—Sind, Gujarat, Deccan, Konkan.
- (134) *Phaseolus vulgaris*, L.—Cultivated—S. America.
- (135) *Phaseolus mungo*, L., var. *roxburghii*, Prain—Cultivated in the rainy season.
- (136) *Phaseolus aconitifolius*, Jacquin.—Cultivated in the rainy season.
- (137) *Clitoria ternata*, L.—Common in hedges; flowers: Aug.-Nov.—Generally in the Tropics.
- (138) *Dolichos lablab*, L.—Cultivated—Tropics of the Old World.
- (139) *Rhynchosia minima*, DC.—Common in hedges—flowers: Aug.-Jan.—Sind, Gujarat, Deccan, Konkan, S. M. Country, India—Ceylon, throughout the Tropics, Cape, United States.
- (140) *Pongamia glabra*, Vent.—Planted.
- (141) *Cajanus indicus*, Spreng.—Cultivated—Tropical Africa.
- (142) *Cicer arietinum*, L.—Very little grown. Cold weather.
- (143) *Casalpinia bonducella*, Fleming.—Not common; flowers: Aug.-Sept.—Sind, Deccan, Kanara—India, throughout the Tropics.
- (144) *Casalpinia pulcherrima*, Swartz.—Cultivated.
- (145) *Poinciana elata*, L.—Planted.
- (146) *Poinciana regia*, Bojer.—Planted.—Madagascar.
- (147) *Parkinsonia aculeata*, L.—Naturalized—Tropical America.
- (148) *Cassia occidentalis*, L.—Not common; flowers: Aug.-Oct.—Throughout India and the Tropics.

- (149) *Cassia sophora*, L.—Not common; flowers: Aug.-Nov.—India, most Tropical Countries.
 - (150) *Cassia tora*, L.—Not common; flowers: Sept.-Dec.—India, generally throughout the Tropics.
 - (151) *Cassia auriculata*, L.—Gujarat, Deccan, Konkan, S. M. Country, Western Peninsula, Central Provinces—Ceylon.
 - (152) *Cassia obtusa*, Roxb.—Not common; flowers: Nov.-Feb.—Sind, Gujarat, Deccan, S. M. Country.
 - (153) *Cassia holosericea*, Fresen.—Flowers: Nov.-Jan.—Sind—Arabia, Tropical Africa.
 - (154) *Cassia pumila*, Lamk.—Very common; flowers: Aug.-Sept.—Deccan, S. M. Country, Kanara.—Tropical Asia and Australia.
 - (155) *Tamarindus indica*, L.—Not common, about villages, cultivated.
 - (156) *Bauhinia racemosa*, Lamk.—Rare; flowers: March-June—Deccan, Konkan, India—Ceylon, China, Timor.
 - (157) *Prosopis spieigera*, L.—Very common; flowers: Dec.-March—Sind, Gujarat, India—Behuchistan, Afghanistan, Persia.
 - (158) *Dichrostachys cinerea*, W. and A.—Rare, on dry stony ground; flowers: Oct.-Nov.—Deccan, S. M. Country, Kanara, India—Ceylon, Malay Islands, N. Australia.
 - (159) *Mimosa rubicaulis*, Lamk.—Flowers: Sept.-Nov.—Sind, Deccan, throughout India, Afghanistan.
 - (160) *Mimosa hamata*, Willd.—Common; flowers: Sept.-Oct.—Gujarat, Deccan, Konkan, S. M. Country, Western Peninsula.
 - (161) *Acacia arabica*, Willd.—Very common; flowers: July-Feb.—India—Ceylon, Arabia, Egypt, Tropical Africa, Natal.
 - (162) *Acacia farnesiana*, Willd.—Not indigenous; flowers: Sept.-March—Sind, Deccan, throughout the Tropics.
 - (163) *Acacia eburnea*, Willd.—Pretty common; flowers: Nov.-Feb.—Sind, S. M. Country, India—Ceylon, Arabia, Afghanistan.
 - (164) *Acacia jacquemonti*, Benth.—Rare; flowers: Jan.-May—Sind, Gujarat, Pnnjab, Rajputana.
 - (165) *Acacia leucophloea*, Willd.—Common; flowers: Dec.-Feb.—Deccan, S. M. Country.
 - (166) *Acacia catechu*, Willd., var. *sundra* Prain.—Pretty common in bushy localities—Gujarat, Deccan, Konkan, S. M. Country.
 - (167) *Albizia lebbek*, Benth.—Planted in gardens and near wells; flowers: March-May—Tropical and subtropical Asia and Africa.
32. *Rosaceae*.—
- (168) *Potentilla supina*, L.—Flowers: Oct.-Nov.—Sind, Gujarat, India—Afghanistan, Atlantic, N. Africa, N. Asia.
33. *Saxifragaceae*.—
- (169) *Vahlia viscosa*, Roxb.—Flowers: Dec.-Jan.—Sind, Gujarat, Konkan, India—Persia, Egypt, Tropical Africa.

34. *Haloragidaceæ*—

- (170) *Myriophyllum intermedium*, DC.—In ponds—Deccan, S. M. Country, Kanara, Western Peninsula—Malaya, Australia, New Zealand, S. America.

35. *Rhizophoraceæ*—

- (171) *Rhizophora mucronata*, Lamk.—In salt-marshes and tidal creeks : flowers : Aug.-Jan.—From Sind to Kanara—Tropics of the Old World and Australia.
- (172) *Rhizophora conjugata*, L.—Less common than the foregoing species, in the same localities ; flowers : Aug.-Jan.
- (173) *Bruguiera gymnorhiza*, Lamk.—In salt marshes along the coast.

36. *Myrtaceæ*.—

- (174) *Eugenia jambolana*, Lamk.—In gardens and near wells : flowers : March-May—Throughout the Presidency, but not in Sind, India generally—Ceylon, Malaya, Australia.
- (175) *Psidium guajava*, L.—Cultivated—Mexico.

37. *Lythraceæ*—

- (176) *Ammannia baccifera*, L.—Flowers : Nov.-Dec.—Sind, Gujarat, Deccan, Kanara, Konkan, India—Ceylon, Afghanistan, Malaya, China, Australia, Tropical Africa.
- (177) *Ammannia salicifolia*, Monti.—Flowers : Nov.—Sind, Deccan, S. M. Country, Konkan, throughout India—Tropical Africa.
- (178) *Lawsonia inermis*, L.—Growing wild and cultivated.
- (179) *Punica granatum*, L.—Cultivated—Wild in Persia, Beluchistan, Afghanistan.

38. *Cucurbitaceæ*—

- (180) *Trichosanthes anguina*, L.—Cultivated.
- (181) *Momordica charantia*, L.—Cultivated. Sind, Deccan, throughout India—Ceylon, Malaya, China, Tropical Africa.
- (182) *Momordica balsamina*, L.—Flowers : Nov.-Dec.—Sind, Deccan, Gujarat, Panjab, N.-W. Provinces—Malaya, Australia, W. Asia, Africa.
- (183) *Luffa Egyptiaca*, Mill.—In gardens.
- (184) *Luffa echinata*, Roxb.—Flowers : Sept.-Oct.—Sind, Gujarat—Tropical Africa.
- (185) *Cucumis trigonus*, Roxb.—Common ; flowers : Aug.-Dec. Sind, Deccan, all over India—Ceylon, Afghanistan, Persia, Malaya, N. Australia.
- (186) *Cucumis melo*, L.—Cultivated—Probably indigenous in N.-W. India, Beluchistan and Tropical Africa.
- (187) *Cucumis melo*, L. var. *agrestis*, Naud.—Common—Sind, Deccan, S. M. Country.
- (188) *Bryonopsis laciniosa*, Naud.—Not common, in hedges : flowers

- Aug.-Oct.—Deccan, S. M. Country, throughout India—Ceylon, Tropical Africa, Mauritius, Malaya, Australia.
- (189) *Citrullus colocynthis*, Schrader.—Pretty common on sandy ground—Sind, Gujarat, Deccan, Konkan, all over India—Ceylon, Arabia, W. Asia, Africa, Spain.
- (190) *Citrullus vulgaris*, Schrad.—Cultivated—Wild in Tropical Africa.
- (191) *Coccinia indica*, W. and A.—Very common in hedges; flowers: Almost throughout the whole year—Sind, Gujarat, S. M. Country, Deccan, all over India—Ceylon, Malaya, Tropical Africa.
- (192) *Melothria maderaspatana*, Cogniaux.—Common in hedges and bushes—Sind, Gujarat, Deccan, Konkan, S. M. Country, all over India—Ceylon, Africa, Malaya, Australia.
- (193) *Blastania garcini*, Cogniaux.—Not common; flowers: Oct.-Nov.—Deccan, Gujarat, S. M. Country.
- (194) *Corallocarpus epigeus*, C. B. Clarke.—Pretty common—Sind, Gujarat, Deccan, S. M. Country, Punjab, Western Peninsula—Ceylon.
- (195) *Lagenaria vulgaris*, Seringe.—Cultivated.—Wild in Malabar, Dehra Doon—Abyssinia, Moluccas.
- (196) *Cucurbita moschata*, Duchesne.—Cultivated.
- (197) *Cucurbita maxima*, Duchesne.—Cultivated.
- (198) *Cucurbita pepo*, L.—Cultivated.
39. *Cactaceæ*—
- (199) *Opuntia dillenii*, Haw.—Not common; used for hedges.
40. *Ficoidea*—
- (200) *Trianthema monogyna*, L.—Very common; Sind, Deccan, all over India—Ceylon, most Tropical Countries.
- (201) *Trianthema triquetra*, Rottl. & Willd.—Very common; flowers Sept.-Nov.—Sind, Gujarat, Deccan, S. M. Country, Konkan, Punjab, W. Peninsula—Ceylon.
- (202) *Trianthema pentandra*, L.—Common; flowers: Oct.-Dec.—Sind, Deccan, S. M. Country, Konkan, Punjab, N.-W. Provinces, W. Peninsula—Tropical Africa.
- (203) *Orygia decumbens*, Forsk.—Flowers: Dec.-Feb.—Sind, Punjab, Mysore—Western Asia, Africa.
- (204) *Mollugo hirta*, Thunb.—Not common, in dried up water holes.—Sind, Deccan, S. M. Country, Konkan, all over India—Ceylon warmer regions of the World.
- (205) *Gisekia pharmaceoides*, L.—Rare; flowers: Sept.-Oct.—Sind, Gujarat, S. M. Country, Konkan, Punjab, W. Peninsula, Ceylon, Beluchistan, Afghanistan, Africa.
41. *Umbelliferae*.—
- (206) *Daucus carota*, L.—Cultivated.
- (207) *Coriandrum sativum*, L.—Cultivated.

42. *Rubiaceæ*.—

- (208) *Spermacoe stricta*, L.—Rare : flowers : Nov.-Dec.—Deccan, S. M. Country, Konkan, India—Ceylon, Tropical Asia and Africa.

43. *Compositæ*.—

- (209) *Vernonia cinerea*, Less.—Very common—Aug.-Jan.—Sind, Gujarat, Deccan, Konkan, S. M. Country, Tropical India—Asia, Africa and Australia.
- (210) *Adenostemma viscosum*, Forst.—Common near watercourses, in gardens and fields : flowers : Sept.-Feb.—Deccan, Konkan, S. M. Country, all over India—Ceylon.
- (211) *Grangea maderaspatana*, Poir.—Flowers : Nov.-April.—Sind, Konkan, Kanara, S. M. Country, throughout India—Ceylon, Tropical and Subtropical, Asia and Africa.
- (212) *Blumea amplexans*, DC.—Flowers : Dec.-Jan.—Gujarat, Konkan, throughout India—Ceylon.
- (213) *Pluchea tomentosa*, DC.—Flowers : Dec.-Feb.—Sind, Deccan, Konkan, Kanara, S. M. Country, Western Peninsula, Central India, Bengal.
- (214) *Pluchea wallichiana*, DC.—Not common : flowers : Jan.-Feb.—Sind, Gujarat, Punjab—Beluchistan.
- (215) *Pluchea arguta*, Boiss.—Not uncommon in stony ground and by the sides of watercourses : flowers : Nov.-Feb.—Sind, Punjab, Beluchistan.
- (216) *Sphaeranthus indicus*, L.—Rare, in moist ground : flowers : Nov.-Feb.—Gujarat, Deccan, Konkan, S. M. Country, all over India—Ceylon, Africa, Malay Islands, Australia.
- (217) *Gnaphalium luteo-album*, L.—Sind, Deccan, Konkan, hot and warm temperate countries.
- (218) *Gnaphalium indicum*, L.—Flowers : Dec.-Feb.—Sind, Deccan, S. M. Country—India, Burma, Africa, China, Japan, Australia.
- (219) *Inula grantioides*, Boiss.—Common on rocky ground : flowers : Nov.-Jan.—Sind, Beluchistan, Waziristan, S. E. Arabia.
- (220) *Viccia auriculata*, Cass.—Flowers : Nov.-Feb.—Deccan, Konkan, S. M. Country—India, Ceylon.
- (221) *Pulicaria angustifolia*, DC.—Common in sandy soil : flowers : Nov.-Jan.—Sind, Gujarat, Konkan, Western Peninsula, Chota Nagpur, Bengal—Beluchistan.
- (222) *Siegesbeckia orientalis*, L.—Flowers : Nov.-Jan.—Deccan, S. M. Country—Most tropical and subtropical countries of the world.
- (223) *Eclipta erecta*, L.—Flowers : Nov.-Jan.—Sind, Deccan, Konkan, Western Peninsula, Central India, Punjab, Bengal—Burma, Ceylon, Malaya, everywhere in warm climates.
- (224) *Blainvillia rhomboides*, Cass.—Flowers : Sept.-Oct.—Sind, Deccan—India, Ceylon, Java, America, Australia.

- (225) *Bidens pilosa*, L.—Flowers: Almost all the year—Deccan—Most warm countries.
- (226) *Echinops echinatus*, Roxb.—Flowers: Nov.-Jan.—Sind, Deccan, Konkan, S. M. Country, all over India.
- (227) *Voltairea divaricata*, Benth. & Hook. f.—Flowers: Nov.-Dec.—Sind, Gujarat, Deccan, Konkan, Western, Central, and Southern India—Beluchistan, Afghanistan.
- (228) *Dicoma tomentosa*, Cass.—Flowers: Nov.-March—Sind, Gujarat, Deccan, S. M. Country—W. Peninsula, N.-W. Provinces, Tropical Africa.
- (229) *Lactuca remotiflora*, DC.—Sind, Deccan, S. M. Country—N.-W. Provinces, Arabia.
- (230) *Launaea pinnatifida*, Cass.—Common; Dec.-Jan.—Sind, Gujarat, Konkan—India, Ceylon, Mauritius, Egypt, E. Africa.
44. *Goodeniaceae*.—
- (231) *Seavola konigii*, Vahl.—On the sea-coast; flowers: July-Aug.—Sind, Konkan—Sea-shores of India, Ceylon, Tropical E. Asia, Australia, Polynesia.
45. *Plumbaginaceae*.—
- (232) *Statice stocksii*, Boiss.—Flowers: Dec.-Feb.—Sind, Gujarat—Beluchistan.
46. *Primulaceae*.—
- (233) *Anagallis arvensis*, L.—Rare: flowers: Sept.-Jan.—Deccan—Most temperate regions.
47. *Myrsinaceae*.—
- (234) *Agiceras majus*, Gaertn.—On the sea-coast—Sind, Konkan, Kanara.
48. *Sapotaceae*.—
- (235) *Minusops elengi*, L.—Cultivated; flowers: Dec.-March.—Gujarat, Deccan, Konkan, Kanara—Western Peninsula—Ceylon, Malaya.
- (236) *Minusops hexandra*, Roxb.—Cultivated in gardens and near wells: flowers: Sept.-Dec.—Gujarat, Deccan, Konkan, S. M. Country—W. Peninsula, Ceylon.
49. *Oleaceae*.—
- (237) *Jasminum sambac*, Ait.—Cultivated.
50. *Salvadoraceae*.—
- (238) *Salvadora persica*, L.—Very common; flowers: Nov.-Feb.—Sind, Gujarat, Deccan, Konkan, Kanara, S. M. Country—Drier regions of India, Ceylon, dry parts of W. Asia, Egypt, Abyssinia.
- (239) *Salvadora oleoides*, Decaisne.—Common; flowers: Dec.-March.—Sind, Gujarat, Punjab, Rajputana, Aden.
51. *Apocynaceae*.—
- (240) *Nerium odorum*, Soland.—Grown in gardens, found as an escape in some places; flowers: All the year.—Indigenous in the Western Himalaya and Nepal.

- (241) *Plumeria acutifolia*, Poir.—Cultivated.—Indigenous in Tropical America.
52. *Asclepiadaceæ*.—
- (242) *Periploca aphylla*, Decaisne.—Common on rocky ground, Sind, Panjab—Afghanistan, Beluchistan, Persia, Arabia, Egypt.
- (243) *Glossonema varians*, Benth.—Flowers: Dec.—Sind.—Beluchistan, Persia.
- (244) *Calotropis procera*, R. Br.—Very common; flowers: Dec. Jan.—Sind, Deccan, Gujarat—Dry parts of India: Ava, Persia, Tropical Africa.
- (245) *Oxystelma esculentum*, R. Br.—Flowers: Dec.—Sind, Deccan, Konkan, Kanara, S. M. Country.—India, Ceylon, Java.
- (246) *Pentstemon microphylla*, W. & A.—Very common; flowers: Sept.—Dec.—Gujarat, Deccan, Konkan—Western Peninsula, Bengal, Pegu, Ceylon.
- (247) *Demia extensa*, R. Br.—Very common; flowers: Sept.—Jan.—Sind, Gujarat, Deccan, Konkan, S. M. Country.
- (248) *Sarcostemma breviflora*, Wight.—Common in stony places.—Deccan, Konkan, S. M. Country—Western Peninsula, Bengal, Burma.
- (249) *Leptadenia reticulata*, W. & A.—Rare.—Gujarat, Deccan, Konkan, S. M. Country, Kanara—Western Peninsula, Panjab, Burma, Ceylon, Singapore, Ava.
- (250) *Leptadenia spartium*, Wight.—Very common; flowers: Dec. Jan.—Sind, Gujarat—Panjab, Beluchistan, Arabia, Egypt.
53. *Gentianeæ*.—
- (251) *Elaeostemma littorale*, Blume.—Common; flowers: Nov. Dec.—Sind, Gujarat, S. M. Country, Konkan—Greater part of India, Ceylon, Malaya, Tropical Africa, W. India.
54. *Boraginaceæ*.—
- (252) *Cordia myxa*, L.—Pretty common in gardens and near wells.—Sind, Gujarat, Deccan, Konkan—All over India, Ceylon, Egypt, Cochinchina, Tropical Australia.
- (253) *Cordia rothii*, Roem. & Schult.—Very common; flowers: Nov. Dec.—Sind, Gujarat, Deccan—W. Peninsula, Panjab, Rajputana, Ceylon, Arabia, Abyssinia.
- (254) *Coldenia procumbens*, L.—Flowers: Oct.—Dec.—Sind, Deccan, Konkan, S. M. Country, Kanara—Tropics generally.
- (255) *Heliotropium zeylanicum*, Lam.—Common; flowers: Oct.—Jan.—Sind, Gujarat, S. M. Country, Konkan—Western Peninsula, Panjab, Tropical Africa.
- (256) *Heliotropium sepioides*, L.—Common; flowers: Feb.—March.—Sind, Gujarat, Deccan, Konkan, S. M. Country—Western Peninsula, Panjab, Upper Gangetic Plain—Ceylon, S. Europe, N. & S. Africa, Canary Islands.

- (257) *Heliotropium paniculatum*, R. Br.—Rare—Sind, S. M. Country
W. Peninsula, Pegu, Ceylon, Siam, Australia.
- (258) *Trichodesma indicum*, R. Br.—Common; flowers: Sept.-Nov.—
Deccan, Konkan, S. M. Country—Greater part of India, Ceylon,
Cabul, Beluchistan, Persia, Mauritius.
- (259) *Trichodesma zeylanicum*, R. Br.—Common; flowers: Dec.-Jan.—
Gujarat, Deccan, Konkan, S. M. Country, Kanara.
- (260) *Sericostoma pauciflorum*, Stocks.—Flowers: Nov.-Dec.—Sind,
Gujarat.
- (261) *Arnebia hispidissima*, DC.—Sind, Gujarat—Western Egypt, Nubia.
35. *Convolvulaceae*.—
- (262) *Cuscuta reflexa*, Roxb.—Flowers: Dec.-Feb.—Gujarat, S. M.
Country, Konkan—Throughout India, Ceylon, Malaya.
- (263) *Cuscuta chinensis*, Lamk.—Common; flowers: Aug.-Oct.—Deccan—
Greater part of India, Ceylon, Persia, Australia.
- (264) *Cressa cretica*, L.—Not common; flowers: Nov.-Jan.—Sind, Gujar-
at, Deccan, Konkan, Kanara—Warm regions generally.
- (265) *Evolvulus alsinoides*, L.—Very common; flowers: Aug.-Jan.—
Sind, Gujarat, Deccan, Konkan—Tropical and Subtropical
countries.
- (266) *Breweria latifolia*, Benth.—Flowers: Dec.—Sind, Gujarat—Pan-
jab, Tropical Africa.
- (267) *Convolvulus rotundifolius*, Choisy.—Not common; flowers: Sept.
Oct.—Deccan, Western Peninsula, Afghanistan.
- (268) *Convolvulus microphyllus*, Sieb.—Very common in sandy soil.—
Sind, Gujarat—Beluchistan to Egypt and Nubia.
- (269) *Convolvulus glomeratus*, Choisy.—Flowers: Dec.—Sind, Gujarat—
Panjab, Afghanistan, Beluchistan, W. Tropical Africa.
- (270) *Convolvulus arvensis*, L.—Common in cultivated ground; flowers:
Dec.-Febr.—Sind, Gujarat, Deccan, Kanara—Throughout the
world.
- (271) *Merremia hastata*, Hallier f.—Rare; flowers: Aug.-Dec.—Deccan,
Konkan, Kanara, S. M. Country—W. Peninsula, Bengal—Ceylon,
S. E. Asia, Australia, Tropical Africa.
- (272) *Ipomoea pentaphylla*, Hallier f.—Not common—Gujarat, Konkan—
W. Peninsula, Africa, Tropical America, Polynesia.
- (273) *Ipomoea pinnata*, Sweet.—Common; flowers: Sept.-Oct.—Sind, Gujarat
—W. Himalaya, Panjab, Bengal, Tropical Africa.
- (274) *Ipomoea biloba*, Forsk.—Common on the sandy sea shore.
flowers: all the year round.—Throughout the Tropics on the sea
shore.
- (275) *Ipomoea pes-tigridis*, L.—Very common on sandy ground; flowers:
Oct.-Dec.—Gujarat, Deccan, Konkan, S. M. Country—Throug-
hout India, Ceylon, Malaya, China, Polynesia, Tropical Africa.

- (276) *Ipomœa aquatica*, Forsk.—In ponds, not common ; flowers : Nov.
April.—Throughout the Presidency—All over India, Ceylon,
Tropical Asia, Africa, Australia.
- (277) *Rivea hypocrateriformis*, Choisy—Common ; flowers : Sept., Dec.—
Sind, Deccan, Konkan—Western Peninsula, Assam.
- (278) *Argyrea speciosa*, Sweet.—In gardens ; throughout India, Java.

(To be continued.)

ON THE FLORA OF Cutch.

BY

E. BENTLEY, Esq.

PART II.

*(Continued from page 777 of Vol. XVIII).*56. *Solanaceæ*.—

- (279) *Solanum nigrum*, L.—In cultivated ground; flowers: Oct.-Jan.—Sind, Deccan, Konkan, S. M. Country—Temperate and tropical regions of the world.
- (280) *Solanum xanthocarpum*, Schrad. & Wendl.—Sind, Deccan, Konkan—All over India, Ceylon, S. E. Asia, Malaya, Tropical Australia, Polynesia.
- (281) *Solanum indicum*, L.—Common.—Deccan, Konkan—Tropical India, Ceylon, Malaya, China, Philippines.
- (282) *Solanum trilobatum*, L.—Not common; flowers: Dec.-Jan.—Gujarat, Deccan, S. M. Country—W. Peninsula, Ceylon, Malay Peninsula.
- (283) *Solanum tuberosum*, L.—Cultivated—Indigenous in America.
- (284) *Solanum melongena*, L.—Cultivated.
- (285) *Withania somnifera*, Dunal.—Rare.—Sind, Gujarat, Deccan, Konkan—Drier regions of India, Ceylon, Mediterranean regions, Canaries, Cape of Good Hope.
- (286) *Lycium barbarum*, L.—Common; flowers: Nov.-Dec.—Sind, Gujarat—Panjab, Beluchistan, Afghanistan, Persia.
- (287) *Datura fastuosa*, L.—var. *alba*, C. B. Clarke.—Common; flowers: Sept.-Dec.—Throughout the Presidency.
- (288) *Lycopersicum esculentum*, Mill.—Cultivated.—Indigenous in Tropical America.
- (289) *Nicotiana tabacum*, L.—Cultivated.—Probably indigenous in S. America.
- (290) *Capsicum frutescens*, L.—Cultivated.

57. *Scrophulariaceæ*.—

- (291) *Celsia coromandeliana*, Vahl.—Flowers: Jan.-May.—Sind, Gujarat, Deccan, Konkan—All over India, Ceylon, Afghanistan, Ava, China.
- (292) *Linaria ramosissima*, Wall.—Pretty common in rocky places.—Throughout the Presidency—Throughout India, Afghanistan, Ava.
- (293) *Veronica anagallis*, L.—Flowers: Nov.-Jan.—Deccan, Konkan—Western Peninsula, Panjab, Kashmir, Bengal, Assam, Bhotan, N. Asia, S. Africa, Europe, N. America.
- (294) *Linden e gia urticifolia*, Link. & Otto.—Flowers: Nov.-Dec.—Sind, Deccan—All over India, Afghanistan.

58. *Orobanchaceae*.—

- (295) *Orobancha ægyptiaca*, Pers.—Gujarat, Deccan—Plains of India, Central and Western Asia.

59. *Bignoniaceae*.—

- (296) *Tecomella undulata*, Seem.—Not common.—Sind, Gujarat, Deccan—Western Peninsula, Panjab, Rajputana, Beluchistan, Arabia.
(297) *Millingtonia hortensis*, L.f.—In gardens—Probably a native of Burma and the Malay Archipelago.

60. *Podaliaceae*.—

- (298) *Pedaliium murex*, L.—Very common; flowers: Sept.-Dec.—Gujarat, Konkan, S. M. Country—India, Ceylon, Tropical Africa.
(299) *Sesamum indicum*, L.—Cultivated—Probably indigenous in Tropical Africa.

61. *Acanthaceae*.—

- (300) *Elephantia indica*, T. Anders.—Sind, Gujarat.—Panjab.
(301) *Asteraxantha longifolia*, Nees.—Common; flowers: Aug.-Jan.—Deccan, Konkan—Throughout India, Ceylon, Tropical and South Africa.
(302) *Ruellia patula*, Jacq.—Flowers: Aug.-Dec.—Sind, Deccan, S. M. Country—W. Peninsula, Rajputana, Bandelkand, Ceylon, Arabia, Tropical Africa, Ava.
(303) *Barleria prionitis*, L.—Common; flowers: Oct.-Jan.—Sind, Gujarat, Deccan, Konkan—All over India, Tropical Asia, Tropical and South Africa.
(304) *Barleria cristata*, L., var. *dichotoma*, Prain.—Probably cultivated; flowers: Dec.
(305) *Lepidagathis cristata*, Willd.—Common; flowers: Oct.-March.—Deccan, Konkan, S. M. Country—Western Peninsula.
(306) *Rungia repens*, Nees.—Common; flowers: Nov.-Jan.—Deccan, Konkan, Kanara, S. M. Country—All over India, Ceylon.
(307) *Justicia heterocarpa*, T. Anders.—Flowers: Oct.-Dec.—Sind, Gujarat—Panjab, Tropical Africa.
(308) *Justicia diffusa*, Willd.—Flowers: Oct.-Dec.—Sind, Deccan—W. Peninsula, Panjab, Ceylon, Rangoon, Siam.
(309) *Justicia simplex*, D. Don.—Flowers: Nov.-Dec.—Sind, Gujarat, Konkan, Kanara, S. M. Country—W. Peninsula, Central India, Kashmir, Bengal, Abyssinia, Malay Islands.
(310) *Peristrophe bicaleculata*, Nees.—Flowers: Oct.-Nov.—Sind, Gujarat, Deccan, Konkan, Kanara—All over India, Tropical Africa.

62. *Verbenaceae*.—

- (311) *Lippia nodiflora*, Michaux.—In sandy soil.—Sind, Gujarat, Deccan—India generally, Ceylon, Africa, most tropical and subtropical countries.
(312) *Premna integrifolia*, L.—Near the coast.—Konkan, Kanara—Ceylon, Andamans, Nicobars, Malaya.

- (313) *Clerodendron phlomidis*, L. f.—Not common, in hedges: Gujarat, Deccan, Konkan, S. M. Country—Dry parts of India, Ceylon.
- (314) *Avicennia officinalis*, L.—Along the coast.—Konkan, Kanara.—Salt marshes and tidal creeks of India, Ceylon, Malaya, shores of the Indian and Pacific Oceans.
63. *Labiatae*.—
- (315) *Ocimum sanctum*, L.—Probably cultivated.—Throughout India (cultivated), Malay Archipelago, Australia, Arabia, W. Asia.
- (316) *Ocimum canum*, Sims.—Flowers: Sept.-Jan.—Deccan, Konkan, S. M. Country—Plains and lower hills of India, Ceylon, Java, W. Asia, Tropical Africa, Madagascar.
- (317) *Ocimum basilicum*, L.—Cultivated.—A native of the Panjab.
- (318) *Amsomeles ovata*, R. Br.—Common in the Presidency except Sind—Throughout India, Ceylon, Malay Archipelago, China, Philippines.
- (319) *Leucas urticifolia*, R. Br.—Flowers: Nov.-Dec.—Sind, Gujarat, Deccan—W. Peninsula, Panjab, Bengal, Beluchistan, Arabia, Abyssinia.
- (320) *Leucas linifolia*, Spreng.—Common; flowers: Oct.-Nov.—Deccan, Konkan—Plains of India, Mauritias, Java, Philippines.
- (321) *Leucas cephalotes*, Spreng.—Common; flowers: Nov.-Dec.—Gujarat—W. Peninsula, Panjab, Bengal, Assam, Himalayas, Afghanistan.
- (322) *Salvia aegyptiaca*, L., var. *pumila*, Hook. f.—Flowers: Nov.-Dec.—Sind, Gujarat, Deccan—W. Peninsula, Panjab, Afghanistan, Beluchistan.
64. *Ngelaginaceae*.—
- (323) *Berhaavia diffusa*, L.—Very common; flowers: Nov.-Dec.—Throughout the Presidency—All over India, Ceylon, tropical and sub-tropical Asia, Africa and America.
- (324) *Berhaavia repanda*, Willd.—Very common; flowers: Oct.-Dec.—Gujarat, Deccan, Konkan—India, Ceylon, Beluchistan.
- (325) *Berhaavia verticillata*, Poir.—Very common; flowers: Sept. Jan.—Sind, Gujarat, Deccan, Konkan—W. Peninsula, Panjab, Afghanistan, Beluchistan to Syria and Tropical Africa.
- (326) *Bongainvillea spectabilis*, Willd.—Cultivated.—Indigenous in Brazil.
65. *Amaranthaceae*.—
- (327) *Celosia argentea*, L.—Pretty common; flowers: Oct.-Dec.—Throughout the Presidency—All over India, Ceylon, Tropical Asia, Africa and America (either cultivated or introduced).
- (328) *Amarantus gauceticus*, L., var. *tristis*, Prain.—Cultivated as a pot-herb.
- (329) *Amarantus blitum*, L., var. *oleaceus*, Hook. f.—Cultivated.
- (330) *Amarantus viridis*, L.—In gardens and cultivated ground.
- (331) *Amarantus polygamus*, L.—In cultivated ground; flowers: Dec. March—India, Ceylon, most hot countries.

- (332) *Amarantus tenuifolius*, Willd.—Bengal, Panjab, W. India, Tropical Africa.
- (333) *Erua javanica*, Juss.—Very common; flowers: Sept.-Dec.—Sind, Deccan—W. Peninsula, Central India, Panjab, Burma, Ceylon, Arabia, Tropical Africa, Cape de Verde Islands.
- (334) *Erua monsonica* Mart.—Very common; flowers: Oct.-Jan.—S. M. Country—Central India, W. Peninsula, Bengal, Burma.
- (335) *Nothosarua brachiata*, Wight.—Flowers: Nov.-Dec.—Sind, Gujarat, Konkan—Western Peninsula, Burma, Ceylon, Mauritius, Tropical Africa.
- (336) *Achyranthes aspera*, L.—Common; flowers: Nov.-Jan.—Sind, Deccan, Konkan—Throughout India, Ceylon, Tropical Asia, Africa, Australia, and America.
- (337) *Pupalia atropurpurea* Moq.—Gujarat—W. Peninsula, Nepal, Bengal, Malaya, Ceylon, Java, Philippines, S. Africa.
- (338) *Pupalia lappacea*, Moq.—Flowers: Sept.-Dec.—Sind, Gujarat, Deccan, S. M. Country—W. Peninsula, Behar, Panjab, W. Tropical Himalaya, Tropical Asia and Africa.
- (339) *Alternanthera triandra*, Lam.—flowers: Aug.-Dec.—Throughout the Presidency—All warm countries.
66. *Cheupodiaceae*.—
- (340) *Atriplex stocksii*, Boiss.—Flowers: Dec.-Jan.—Sind, Gujarat.
- (341) *Salicornia brachiata*, Roxb.—Flowers: Nov.-Dec.—Gujarat—Bengal, Ceylon.
- (342) *Suaeda fruticosa*, Forsk.—Flowers: Nov.-Dec.—Sind, Gujarat—N. W. India, Panjab, Africa, America.
- (343) *Suaeda nudiflora*, Moq.—Konkan, Orissa—W. Peninsula, Ceylon.
- (344) *Haloxylon recurvum*, Bunge.—Flowers: Nov.-Dec.—Sind—Coimbatore, Burma, Panjab, Afghanistan, Yunnan.
- (345) *Salsola foetida*, Del.—Flowers: Dec.—Sind—Panjab, Beluchistan, Persia, Arabia, N. Africa.
67. *Polygonaceae*.—
- (346) *Polygonum plebejum*, R. Br., var. *indica*, Hook. f.—Common.—Deccan, Konkan, S. M. Country, Kanara.
- (347) *Polygonum glabrum*, Willd.—Flowers: Oct.-Feb.—Sind, Deccan, Konkan, Kanara—All over India, Ceylon, Australasia, China, Africa, America.
68. *Aristolochiaceae*.—
- (348) *Aristolochia bracteata*, Retz.—Flowers: Sept.-Dec.—Sind, Gujarat, Deccan, Konkan—Bengal, Ceylon, Arabia, Tropical Africa.
69. *Euphorbiaceae*.—
- (349) *Euphorbia nerifolia*, L.—Very common on rocky ground; flowers: March.—Sind, Gujarat—N. W. Himalaya, Pegu, Burma.

- (350) *Euphorbia hypericifolia*, L., var. *parviflora*, Hook. f.—Very common; flowers: Aug.-Dec.—Sind, Gujarat, Deccan, Konkan.—Throughout the Tropics except Australia and the Pacific Islands.
- (351) *Euphorbia pilulifera*, L.—Common; flowers: More or less throughout the year.—Most tropical and subtropical regions.
- (352) *Euphorbia thymifolia*, L.—Very common; flowers: All the year round.—Sind, Deccan—Plains and lower hills of India, Ceylon, all hot countries except Australia.
- (353) *Euphorbia tirucalli*, L.—Common in hedges—Indigenous in America.
- (354) *Flaggea leucopyrus*, Willd.—Throughout the Presidency—Panjan, Burma, Ceylon.
- (355) *Phyllanthus reticulatus*, Poir.—Flowers: Throughout the year.—Gujarat, Konkan, Kanara, S. M. Country—Tropical India, Ceylon, Tropical Africa, China, Malay Islands.
- (356) *Phyllanthus maderaspatensis*, L.—Deccan, S. M. Country—Other parts of India, Ceylon, Tropical Africa, Arabia, Java, China, Australia.
- (357) *Phyllanthus niruri*, L.—Common; flowers: Nov.-Dec.—Deccan, Konkan—All over India, Ceylon, in the Tropics generally except America.
- (358) *Chrozophora prostrata*, Dalzell.—Sind, Deccan, S. M. Country.—Throughout India, N. Africa.
- (359) *Ricinus communis*, L.—Cultivated—Probably indigenous in Africa.
70. *Urticaceæ*.—
- (360) *Ficus bengalensis*, L.—Planted.
- (361) *Ficus retusa*, L.—Planted.
- (362) *Ficus religiosa*, L.—Planted.
- (363) *Ficus tsiela*, Roxb.—Planted.—Western Peninsula, Central Provinces, Ceylon.
71. *Ceratophyllaceæ*.—
- (364) *Ceratophyllum demersum*, L.—In tanks and ponds.—All temperate and tropical regions.
72. *Hydrocharitaceæ*.—
- (365) *Hydrilla verticillata*, Presl.—In tanks; flowers: Dec.—Sind, Deccan, Konkan.—Central Europe, Mauritius, Madagascar, Tropical Asia and Australia.
- (366) *Vallisneria spiralis*, L.—In tanks—Sind, Deccan, Konkan—All over India, Warm regions of the Old and New World.
73. *Liliaceæ*.—
- (367) *Asparagus racemosus*, Willd; var. *javanica*, Baker.—Gujarat, Deccan, Konkan, Kanara, S. M. Country—W. Peninsula, Java.
- (368) *Asphodelus tenuifolius*, Cav.—Flowers: Nov.-Feb.
- (369) *Allium cepa*, L.—Cultivated in the cold season.
- (370) *Allium sativum*, L.—Cultivated.

74. *Commelinaceæ*.—

(371) *Commelia nudiflora*, L.—Common ; flowers : Dec.—Deccan, Konkan, S. M. Country—In many tropical and subtropical countries.

(372) *Commelia bengalensis*, L.—Common ; flowers : Sept.—Dec.

75. *Palmaceæ*.—

(373) *Phoenix sylvestris*, Roxb.—Cultivated.—Throughout India.

(374) *Cocos nucifera*, L.—Cultivated.

76. *Paulowniaceæ*.—

(375) *Pandanus toctorius*, Soland.—Planted. Sea coast of the Indian Peninsula, Burma, Andamans.

77. *Aroidaceæ*.—

(376) *Colocasia antiquorum*, Schott.—Rare—Cultivated in all hot countries.

78. *Lemnaceæ*.—

(377) *Wolffia arrhiza*, Winn.—In tanks.—Throughout India.

79. *Naiadaceæ*.—

(378) *Potamogeton indicus*, Roxb.—In ponds and tanks.—Throughout the plains of India, Sikkim up to 9,000 ft., Burma, Ceylon—Malay and Sandwich Islands.

(379) *Najas minor*, All.—In still sweet water.—Throughout India and Ceylon—Old World generally.

80. *Cyperaceæ*.—

(380) *Kyllingia triceps*, Roth.—From N.-W. India and Sind to Bengal, Burma and Ceylon.—Africa, China, Australia.

(381) *Pycnos polystachyus*, Beauv.—Near the coast.—All warm especially maritime regions.

(382) *Cyperus haspan*, L.—Throughout India—All warm regions.

(383) *Cyperus arvensis*, Retz.—On the seacoast.—From Sind to Ceylon and Orissa, Panjab—Persia, Arabia.

(384) *Cyperus conglomeratus*, Roth.—Sind.—From Sind to N. Africa.

(385) *Cyperus iria*, L.—In rice-fields.—Throughout India—Old World generally.

(386) *Cyperus bulbosus*, Vahl.—Sind, Aligarh, Deccan Peninsula, Ceylon—Tropical Africa, Asia and Australia.

(387) *Cyperus stoloniferus*, Retz.—On the sandy sea shore—From Sind to Ceylon, Malay Peninsula—Mauritius, China, Malaya, Australia.

(388) *Cyperus pygmaeus*, C. B. Clarke.—From Kashmir to Burma and Ceylon.—All warm regions except Europe.

(389) *Eleocharis plantaginea*, Br.—From Sind, Saharapore and Assam to Ceylon and the Malay Peninsula—Tropics of the Old World.

(390) *Fimbristylis tetragona*, Br.—Throughout India except the North-West, up to 3,000 ft.; from Nepal and Bombay to Ceylon and Tavoy.—E. Asia, Australia.

(391) *Fimbristylis dichotoma*, Vahl.—Throughout India up to 4,000 ft.—Warm regions of the Old World.

- (392) *Fimbristylis ferruginea*, Vahl.—Throughout India up to 3,000 ft.—All warmer regions.
- (393) *Fimbristylis spathacea*, Roth.—From Sind and Orissa to Ceylon and Singapore.
- (394) *Scirpus supinus*, L.—India and Ceylon.—Old World generally and America.
- (395) *Scirpus grossus*, L.—Throughout India up to 2,000 ft.—Malaya, Tonkin, Philippines.
- (396) *Scirpus littoralis*, Schrad.—From Kashmir (3,500 ft.) and Bengal to Ceylon.—W. Asia, Africa, Europe, Australia.
51. *Gramineæ*.—
- (397) *Paspalum distichum*, L.—Bombay, on the sea-shore, Gujarat.—All over the tropics.
- (398) *Paspalum sanguinale*, Lamk.—Throughout India and in all warm countries.
- (399) *Panicum colonum*, L.—Sind—All over India, Australia.
- (400) *Panicum turgidum*, Forsk.—Gujarat, Sind—Central India, Beluchistan, Arabia, Egypt.
- (401) *Panicum crus-galli*, L., var. *frumentaceum*.—Cultivated.—Hotter parts of Asia and Africa.
- (402) *Spinifex squarrosus*, Kunth.—On the sandy coast.—India, Burma, Ceylon, Java, China.
- (403) *Pennisetum typhoideum*, Rich.—Cultivated.—All over India and Ceylon.
- (404) *Pennisetum dichotomum*, Delile.—On sand hills; Sind, Gujarat.
- (405) *Pennisetum setosum*, Rich.—Gujarat, Sind—Bundelkund, Central Provinces, Africa, Tropical America.
- (406) *Pennisetum cenchroides*, Rich.—Sind, Gujarat, Deccan—Western India, from Kashmir to the Upper Gangetic Plain, and Southward, Tropical Africa, Canaries, Sicily.
- (407) *Cenchrus ciliaris*, Roxb.—Konkan, Sind—Coromandel, Rajpootana, Upper Gangetic Plain, Panjab, Beluchistan, Arabia, Africa.
- (408) *Trachys mucronata*, Pers.—On the sea-shore.—Gujarat—Deccan Peninsula, Ceylon, Japan.
- (409) *Tragus racemosus* Hall.—Sind, Gujarat, Deccan, from Kashmir to Upper Bengal and southward to Ceylon, Burma, warm regions generally.
- (410) *Hygrophiza aristata*, Nees.—Gujarat, Deccan—Upper and Lower Gangetic Plains, Assam, Chitigong, Pegu, Ceylon, Tonkin.
- (411) *Saccharum spontaneum*, L.—Warmer parts of India and Ceylon, up to 6,000 ft.—Warm regions of the Old World, East Australia.
- (412) *Saccharum officinarum*, L.—Cultivated.
- (413) *Saccharum arundinaceum*, Retz.—Throughout the plains and low hills of India—Ceylon, China.

- (414) *Ischozumum pilosum*, Dalz. and Gibs.—Khandesh, Deccan—Mysore, Asirghar, Bellary, Chanda.
- (415) *Eliouurus royleanus*, Nees.—Sind, Gujarat.—Upper Gangetic Plain, Arabia, Abyssinia, Cape Verd Islands.
- (416) *Andropogon foveolatus*, Del.—Sind, Khandesh, Deccan—Drier parts of India, Tropical Africa, Cape Verd Islands.
- (417) *Andropogon sorghum*, Brot.—Cultivated —Warmer parts of Asia, Africa, Europe.
- (418) *Andropogon annulatus*, Forsk.—Deccan, Gujarat—Throughout the hills and plains of India, Tropical Africa, China, Australia, Pacific.
- (419) *Aristida adscensionis*, L.—Gujarat, Deccan—Throughout the plains and low hills of India, up to 8,000 ft., most warm countries.
- (420) *Aristida funiculata*, Trin. and Rupr.—Sind, Deccan, S. M. Country—Plains of the Panjab, Rajputana, from the Konkan southward, Beluchistan, Arabia, Tropical Africa.
- (421) *Gracilea royleana*, Nees.—Sind, Deccan, Konkan—Panjab Plain, Rajputana, Sind, Central India, Socotra, Nubia.
- (422) *Cynodon dactylon*, Pers.—Throughout India, Burma, and Ceylon, up to 5,000 ft.—All warm countries.
- (423) *Chloris barbata*, Swar.—Throughout the plains of India, Burma, and Ceylon—Tropics generally.
- (424) *Elesine aegyptiaca*, Pers.—Throughout the low country of India, Burma, and Ceylon, Malacca—warm regions of the Old World.
- (425) *Leptochloa chinensis*, Nees.—Gujarat, Konkan—Throughout India and Burma, Ceylon, Malaya, China, Japan, Australia.
- (426) *Phragmites karka*, Trin.—All over India, Afghanistan, Tropical Asia, Africa, Japan, Australia.
- (427) *Eragrostis ciliaris*, Link.—Sind, Gujarat, Deccan, Konkan—All over India, Arabia, Tropical Africa.
- (428) *Halopyrum mucronatum*, Stapf.—Sind, Gujarat, Konkan, Kanara—Coasts of Western India and Ceylon, Arabia, Tropical Africa.
- (429) *Eleiropus villosus*, Trin.—On salt ground.—Sind, Gujarat—Sandy shores of the Deccan Peninsula and Ceylon, salt plains of the Panjab, Afghanistan, Persia, Arabia, Mediterranean region.
- (430) *Triticum vulgare*, L.—Cultivated.
- (431) *Hordeum vulgare*, L., var. *hexastichon*, Aitchis.—Cultivated.

In order to give a more complete idea of the vegetation of Cutch we shall add a few notes on the cultivated plants of that Province. The arable area of Cutch is estimated at about 1,500,000 acres. It consists, generally speaking, of a valley formed between the Dora Hills and the Charwar range, the extensive plain between the Dora Hills and the sea, and inferior valleys formed by subordinate hills in

¹ cf. Bombay Gazetteer, Vol. V.

the ranges, and finally the plains of Vagad. The plain running in from the coast towards the Dora range is the most extensive, and is often twenty and even thirty miles broad, interspersed occasionally with detached hills. Close to the sea-beach is a high bank of sand, which extends from the western end of the Province to the entrance of the Gulf of Cutch, and is called by the natives "Chigo." For the rest, the general appearance of Cutch which is arid and sandy in the extreme, is very often diversified in the neighbourhood of its towns and villages by patches of cultivation. Of grains the following are cultivated in Cutch: *Pennisetum typhoides*, Rich. (Bajri or common Millet). It forms one of the staple crops and when sown in middling soils it grows best where the land is slightly salt. Though generally grown by itself, it is also sown with *Phaseolus mungo*, L. (Mag.) and *Phaseolus acutifolius*, Jacq. (Karad) in Abdasa and Vagad. On the whole it flourishes best as a garden crop. *Aeluropogon sorghum*, Brote. (Juar or Great Millet) does best on deeply cultivated rich clay and is rarely watered. Five chief varieties are grown in Cutch: Juar and Puchar, sown in June or July soon after Millet and Cotton; Gundali, sown before the beginning of the cold weather or towards the end of August; Chastio, sown about the end of February and grown by irrigation; Ratad, sown in July and August as a dry crop, or in the hot season as a watered crop. *Triticum vulgare*, Vill. (Wheat) is chiefly irrigated. Only in some parts of Vagad that are liable to flooding, unwatered wheat is grown. It generally ripens in February. *Hordeum vulgare*, L. var. *herastichum*, Aitchis. (Jav or Barley) is grown by irrigation and reaped in January. In the south alluvial plain and in the plain north-west of Bhuj about Dhinodhar they grow small quantities of *Eloasin coracana*, Gaertn. (Nagli) and *Panicum crus-galli*, L. var. *frumentaceum* (Banti) as cold weather crops. *Panicum miliaceum*, L. is rare. *Saccharum officinarum*, L. (Sugar cane) may be mentioned in this place on account of its position in the natural system of classification. It is grown in small quantities, especially in Central Cutch to the north-west, south-east and south-west of Bhuj, and about Anjar and Mundra. The Pulses are not well represented. In the most sandy parts we find *Phaseolus acutifolius*, Jacq. (Karad). It is mostly sown by itself, but sometimes mixed with *Cyanopsis psoraloides*, DC. (Guvar) which grows best in sandy loam. The same

kind of soil is very suitable to *Phascolus mungo*, L. (Mag). *Cicer arietinum*, L. is very little grown as a cold weather crop. *Ricinus communis*, L. is corimon all over the Province, but chiefly grown as an early crop in Vagad, Kanthi, and eastern Abdasa. It is sown together with Cotton, *Sesamum indicum* DC., and *Guizotia abyssinica*, Cass. are grown in the rainy season, either by spell, as in Vagad and parts of Abdasa, or together with Cotton and Millet in other places. *Brassica campestris* L. var. *napus* (Rapeseed) is a cold weather crop, and grows either by itself or together with wheat. In eastern Abdasa, Kanthi, and Vagad *Gossypium herbaceum*, L. is extensively grown in clay soil. It is picked twice or thrice towards the end of February, in March or April. The common Indian vegetables are cultivated in plenty, and the soil and climate have proved exceedingly favourable to European vegetables. The latter require only constant irrigation during the hot season to preserve them in luxuriance. The following are found in various parts of Cutch: *Hibiscus esculentus*, L.; *Pisum sativum*, L.; *Dolichos lablab*, L.; *Cajanus indicus*, Spreng.; *Phaseolus vulgaris*, L.; *Moringa pterygosperma*, Gaertn.; *Cucumis sativus*, L.; *Cucumis melo*, L.; *Luffa aegyptiaca*, Mill.; *Momordica charantia*, L.; *Trichosanthes anguina*, L.; *Lagenaria vulgaris*, Ser.; *Citrullus vulgaris*, Schrad.; *Cucurbita moschata*, Duchesne; *Cucurbita maxima*, Duchesne; *Cucurbita pepo*, DC. The Melons, generally, are reckoned superior to those of any neighbouring country. They grow in the dry beds of rivers where their roots are in a stream of water a few inches below the surface. Their leaves and fruits being exposed to the double effect of a burning sun upon a scorching sand, the fruit is brought to the greatest perfection. The Melon is ripe in April, May and June. Other vegetables are: *Daucus carota*, L. (Carrot); *Apium graveolens*, L. (Celery); *Solanum melongena*, L. (Brinjal); *Lycopersicon esculentum*, Miller (Tomato); *Brassica oleracea*, L. with many varieties; *Raphanus sativus*, L.; *Allium cepa*, L.; *Allium sativum*, L. Besides, we find the following plants cultivated: *Nicotiana tabacum*, L. (Tobacco); *Solanum tuberosum*, L. (Potato); *Capsicum frutescens*, L. (Chillis). Of fruits *Mangifera indica*, L. (Mango) and *Psidium guajava*, L. (Guava) are largely grown by the help of water. In some parts of the sandy water-bearing yellowish-brown soil we find *Phoenix sylvestris*, Roxb

(Date Palm). Though being inferior to those from Arabia, Persia, and Sind, the Cutch Date is better than any other grown in Western India. *Cocos nucifera*, L. (Coconut) is cultivated in small quantities along the coast. *Vitis vinifera*, L. produces well-flavoured grapes. Other fruit trees are: *Punica granatum*, L. (Pomegranate); *Carica papaya*, L. (Papaya); *Musa sapientum*, L. (Plantain); *Citrus medica*, L. (Citron); *C. medica*, L., var. *limetta* (Sweet Lime); *C. medica*, L., var. *acida* (Sour Lime); *C. medica*, L., var. *limonum* (Lemon); *Citrus aurantium*, L. (Orange); *Citrus decumana* Murr. (Pummelo); *Feronia elephantum*, Carr. (Elephant or Wood Apple); *Anona squamosa*, L. (Custard Apple); *A. reticulata*, L. (Rambul).

The catalogue given above cannot be considered to be complete. It contains those species only that have been collected on our tour from Rohar, on the Gulf of Cutch, to Anjar, Bhuj, and across the Banni, to Pacham Island in the Grand Rann. Our journey, therefore, forms, so to say, a cross-section of the whole Province of Cutch, and as the physical and climatic features of the different parts of Cutch do not vary very much, I think we are right in concluding that this cross-section will give a fair idea of the whole flora. Only a few plants have been added to our list on the authority of Col. Palin; but we have every reason to believe that they occur in the same region which we examined ourselves.

The following remarks apply only to the indigenous plants of which our catalogue contains 315 species. These belong to 71 Natural Orders. The dominant Orders (*viz.*, those represented by the greatest number of species) of the Cutch flora are, roughly taken, the same as those of Hooker's Indus Plain Province. The *Leguminosæ* stand first with 67 species; then there follow the *Graminææ* with 35, the *Malvaceæ* with 24, the *Compositæ* with 22, the *Cyperaceæ* with 17, the *Convolvulaceæ* with 17, the *Cucurbitaceæ* with 15, the *Amarantaceæ* with 13, the *Capparidaceæ* with 12, the *Acanthaceæ*, *Euphorbiaceæ*, and *Solanaceæ* with 11 species. It is very probable that a more thorough exploration of the country will change the rank of some Orders. With regard to the *Graminææ*, *e.g.*, we feel pretty sure that they outnumber the *Leguminosæ*. Though, on the whole, most of the plants seem to be out in December, it is just the grasses that do not present themselves in such a

condition at that time as to furnish sufficient material for their identification. Of the 345 indigenous plants about 30 only are trees, 95 shrubs and undershrubs; all the rest are herbs, mostly perennials. Almost all the plants have a wide geographical distribution with regard to the Indian as well as to the extra-Indian region. No endemic species has been found as yet. Cutch has over 200 species in common with Sind and about 160 with Gujarat. Of the latter about 70 do not occur in Sind, whilst of the former over 80 have not been found in Gujarat. If we consider that Cutch is a country with a long dry season, that the soil is mostly sandy or rocky, that salt is present in the soil not only along the sea shore and in the vicinity of the Great Rann, but more or less all over the country, we shall find it quite natural that most of the plants of Cutch exhibit a remarkable general similarity and agree in having a lower rate of transpiration than plants living in places where plenty of water is available; in short that the vegetation shows a distinct xerophytic character. Nearly all the structural features by which transpiration is reduced may be observed in the flora of Cutch: A thick cuticle upon the epidermis of the leaves, reduction of the number of stomata, depression of the stomata, a thick covering of hairs, reduction of the transpiring surface, formation of aqueous tissue, etc. In the following we shall examine a number of plants in which the xerophytic character is best expressed, indicating briefly the special contrivances by which reduction of transpiration is obtained.

In *Tinospora cordifolia* a corky bark is formed over the woody parts of the plant and, thus, transpiration confined to the younger parts and the leaves.

Cocculus villosus has the younger parts densely villous, also the upper and lower surface of the leaves and the petioles. *Cocculus laha* shows similar formations to those of *Tinospora cordifolia*. *Parsetia jacquemontii*, a rigid shrub, is covered all over with appressed hairs, which, like a thick felt, reduce excessive transpiration. The Order *Capparidaceæ* shows a great variety of adaptations to a dry climate. *Cleome monophylla* is covered with pubescence and even the capsules are clothed with short stout hairs. *Cleome stocksiana* is partly protected by having fleshy leaves which store up a considerable quantity of water.

In *Cleome brachycarpa* the younger stems are covered with

glandular hairs : also the petals are glandular-pubescent as well as the capsules. Those glands secrete an ethereal oil which resembles very much that of the rue. It is just the vapours of that oil which acts protective against too profuse transpiration ; for

is a well known fact that air laden with vapours of an ethereal oil is much less permeable to radiating heat than pure air. In this way a plant, surrounded by a layer of vapours of an ethereal oil, will be protected at day-time against overheating and consequently against excessive transpiration, and at night against too great a cooling down.

The stems and branches of *Gynandropsis pentaphylla* are covered with white spreading hairs and the leaves are pubescent on both sides, whilst the sepals and the ovary are clothed with glandular hairs.

The young stems and branches, including the leaves of *Capparis spinosa* are covered with a grayish-white layer of wax which just allows the green colour to be slightly visible. This contrivance greatly reduces cuticular transpiration. The same effect is produced by the orange colour of the stipules, which in this plant assume the form of two hooked thorns.

The reduction of the transpiring surface is well shown in *Capparis aphylla*. The older branches are quite destitute of leaves, and the younger shoots bear exceedingly small and spinous-pointed leaves. Also in this case, the stipular thorns are not green, but orange-yellow. The young parts of *Capparis horrida* are protected by a rufous tomentum. *Polygala crioptera* has narrow linear leaves, whilst specimens of the same species, but growing in less dry parts of the Presidency have usually oblong-ovate leaves. In *Polycarpa corymbosa* the young branches and the pedicels are hoary-pubescent, the leaves narrow linear. The species of *Portulaca* are protected in various ways: The stems of *P. oleracea* are reddish, the leaves fleshy with reddish margins. We find fleshy leaves also in *Portulaca quadrifida* and *P. tuberosa* : the stipules form a ring of silvery hairs in the former, and a ring of brownish ones in the latter.

Tamarix dioica and *aricoides* have got minute scale-like leaves. Both make use of the hygroscopic salts that collect on the surface of the plant. At times of drought they absorb the moisture which is contained in the atmosphere in the form of vapours. Thus it happens

that very often at night or in the early morning the green parts of the plant are covered with dew, whilst all the other plants in the neighbourhood are quite dry. The white crust that is seen at day-time on the green branches and leaves consists chiefly of chloride of sodium and calcium carbonate with some other saline substances.

Bergia odorata shows the tendency to crowd the leaves into fascicles. It is evident that by this means the leaves cover and protect each other and are, thus, less exposed to the heating influence of the sun. *Sida spinosa* and *rhombifolia*, var. *retusa*, look quite grey from very small stellate hairs. Still better protected is *Abutilon graveolens* which, besides having long spreading hairs, is covered with a sticky coat of short hairs. Of *Grewia villosa*, which is usually found in the dry parts of the Presidency, the branches are grey puberulous, the upper surface of the leaves rough with stellate hairs, the lower velvety, the petioles villous and the stipules hairy, the flower-buds, sepals, and ovary covered with pilose hairs.

Tribulus terrestris and *T. alatus* belong both to the desert flora. Besides being protected by silky villous hairs they perform some special movements by which the plant-surface exposed to insolation is greatly reduced. The leaves are abruptly pinnate. Now, when the heat is rising at noon or in the afternoon, the leaflets begin to turn round their own axis and, at the same time, upwards round the common rachis, till they are lying in one vertical plane with their upper sides touching each other.

Zigophyllum simplex and *Z. coccineum* differ from the above mentioned plants by the distinct succulence of their leaves. In both species they are cylindric, in *Z. simplex* sessile and in *Z. coccineum* bifoliate on a stout fleshy petiole. In the centre there is a thin-walled water-tissue occupying about $\frac{2}{3}$ of the whole diameter in the former, and about $\frac{1}{2}$ in the latter. At the same time, the stomata are depressed. The young branches in *Z. coccineum* are, besides, covered with a white powdery tomentum. The leaves of *Eugenia cretica* are thick, approaching the type of succulent plants. The outer walls of the polygonal cells of the epidermis are very much thickened. *Lotus garcini* is a small undershrub that grows in sandy soil. Its branches are covered with grey silky hairs; the leaflets are extremely small and fleshy, both sides are clothed with grey hairs. Many

species of *Indigofera* and *Tephrosia* are similarly protected. *Alhagi camelorum* is a much-branched rigid shrub armed with axillary spines which produce the flowers. The leaves are not of great importance, being very small and of short duration. Their function is performed by the green tissue of the branches and thorns which have their stomata in pits at right angles to the long axis. *Acacia churra*, indigenous in the dry parts of India, has the young branches purplish-brown: the leaves are very small and the long stipular spines ivory-white. *Echinops echinatus*, a thistle-like herb, is clothed with a white cottony pubescence. The deeply pinnatifid leaves are spinescent, the spines very often reaching one inch: the involucre are surrounded by strong white bristles and the intermediate bracts are usually produced into sharp spines. Of the *Asclepiadaceæ* the following contain a milky juice: *Periploca aphylla*, *Calotropis procera*, *Orystelma esculentum*, *Damia extensa*, *Sarcostemma brevistigma*. I have not been able to ascertain whether the latexiferous tissue, besides being a reservoir of waste-products, contains also plastic substances. The fact that so many plants growing in dry localities develop this tissue makes it very probable that part of the latex is reserved for times of scarcity. *Periploca aphylla* is an erect branched shrub and mostly without any leaves: but when these are present they are extremely small and thick. *Calotropis procera* grows much higher in Cutch than I have ever seen it on the Deccan. The woody parts become quite corky, whilst the young branches and leaves are covered with a cottony tomentum. *Sarcostemma brevistigma* is a twining jointed shrub without leaves: transpiration is confined to the green pendulous branches. *Leptadenia spartium* is mostly leafless: leaves are seen sometimes on young shoots.

Cressa cretica, which is a common undershrub on cultivated fields and blown sand, can be recognized by the great number of very small leaves that are covered all over with a whitish crust of a hygroscopic salt. This is secreted in solution by glandular hairs that are to be found in depressions on both sides of the leaves. It is not very probable that the water supplied by the absorbing action of the salt is sufficient in times of drought, because the leaves are very delicate, the outer walls of the epidermal cells thin and the stomata not depressed at

all. It seems that the rhizome which descends very deep into the substratum furnishes the necessary moisture.

Breweria latifolia, *Convolvulus rotleriaanus*, and *C. microphyllus* are small undershrubs confined to the dry parts of the Presidency. A dense felt of silky hairs and strong outer walls of the epidermis seem to be their chief protection. The transpiring surface of *Solanum xanthocarpum* is considerably reduced by the formation of numerous yellow prickles on the branches and on the midrib and nerves of the leaves. *Solanum indicum* and *S. trilobatum* are similarly armed. *Blepharis indica* is protected in various ways: the stem is mostly very short, often scarcely visible; the branches are ash-grey and covered with short hairs; the leaves are small linear and sessile, rough with stiff hairs, and have the margins bent back; at the base of the leaves there are sometimes some small spinous teeth; the bracts are hairy on both sides with a spinous point, the upper part is armed with recurved sharp spines; the bracteoles are hairy and ciliate; the outer and inner side of the calyx are softly hairy, the 3 midnerves of the larger calyx-segment are produced into 3 bristly teeth. In *Salvia cegyptiaca*, var. *pumila*, we find that the vascular bundles of the main-nerves are surrounded by water-tissue which unites the epidermis of the upper side of the leaf with that of the lower one. As to *Erua javanica* there is scarcely any doubt that the thick woolly felt covering almost all the parts of the plant, is protective in function. In *Salicornia brachiata*, a jointed branched shrub, transpiration is entirely confined to the green branches, there being only scaly bracts and no leaves at all. *Suaeda fruticosa* and *S. nudiflora*, which usually grow in saline places, have fleshy leaves. A transverse section shows that the greatest part is occupied by water-tissue.

Before concluding this paper I should like to make a few remarks on the flora of the Grand Rann, as it has been suggested that a more accurate knowledge of the vegetation of that part of the country might help to decide the question as to the origin of the Rann. I cannot give a better description of that interesting piece of land than the one given by Captain Grant¹ in his

¹ Memoir to illustrate a Geological Map of Cutch, by C. W. Grant, Esq., Captain, Bombay Engineers (in the transactions of the Geological Society of London, Vol. V, p. 239. (11 series)).

"Geology of Cutch." "This tract containing an area of upwards of 7,000 square miles, exclusive of the space occupied by the Bannee, and the islands of Pacliam, Khureer, etc., is perhaps, unparalleled in any known part of the globe, as it may be said to be placed on a level between land and water. It is dry during the greater part of the year, when its surface consists of a sandy flat, totally devoid of vegetation; but, perhaps, on account of its saline nature, always sufficiently moist to prevent its particles being drifted. During the prevalence of the south-west winds, however, so much water is blown up its eastern inlet by the Gulf of Cutch, and, at its western extremity, by the eastern branch of the Indus, as to cover its whole surface; augmented by the freshes, which, at the same time, come down the Loonee and Bumass Rivers, and the numerous small streams which intersect the northern coast of Cutch. At those seasons the Rann has all the appearance of a sea, and is passable only on camels, and in some seasons, with difficulty." At wide intervals we find small patches of coarse rush-like grass, elevated a couple of feet above the general level. They seem to have been flat banks formed by wave action or preserved by vegetation. To the south-west of Pacliam Island almost parallel to the main land stretches a low lying tract, called the Banni. It rises a little higher than the remainder of the Rann and is about 65 miles long and from ten to sixteen broad. In some places, especially near water, it is thickly, but for the most part scantily covered with coarse grass. The Babul (*Acacia arabica*) is the only tree that breaks the monotony of the country. It does not reach the height it attains on the mainland, is usually isolated and rarely found gregarious. Of other plants we noticed only *Solanum xanthocarpum* and some species of *Crotalaria* and *Heliotropium*, growing exclusively near the bee-hive-shaped grass huts of the herdsmen.

There is no definite boundary between the Banni and the Rann. South of Pacliam Island the Rann can only be recognized by a narrow belt devoid of trees. Pacliam Island itself is situated in the centre of the Rann, stretching about 15 miles from north to south and 10 from east to west. It is crossed by two somewhat east and westerly chains of hills: the one to the north is called the Kala Doongur (Black hill) and the one to the south Gora Doongur (White hill). In the former we find the most lofty elevation of

Cutch, the Pacham Pir which rises directly from the Rann to a height of 1437 feet. A most extensive view can be obtained from the summit of this mountain. Beyond a waste of salt and water the Parkar hills are visible, and to the south and south-east appear the dark surface of the Banni and the Cutch hills. The island is surrounded by a margin of low ground of no great width, but narrowest where the mountains rise most steeply from the Rann on the northern side. Sheets of hæmatitic laterite overlap and wrap round the jurassics on the west and south of the low ground, sometimes associated with earthy rocks and beds resembling volcanic ash. Higher up the beds consist of fine white and light coloured silicious sandstone with calcareous bands and sandy slightly ferruginous purple beds; pale flaggy sandstones also occur.

This is not the place to enter into a discussion as regards the arguments of geologists or an examination of the traditions of the natives to the effect that the Rann was once submerged. D. Oldham (Memoirs of the Geological Survey of India, Vol. IX, p. 28) came to the following conclusions: "To whatever causes the great plains of Sind and the coast plains of Western India are due, that of the Rann may also be ascribed. Its origin must be traced further back than the formation of the deltas of the Indus and other neighbouring rivers, because something in the nature of a plain or open ground was necessary to receive such deposits. This open ground was here more hilly than to the north in all probability, for the high islands which rise from the Rann are evidently but the modified summits of an older surface; and the silting-up of the sea-inlet which it formed was only the natural result of its land-locked capacity to retain the materials brought down by rivers. The Bunnee is a bank formed most probably by the discharge of the Kutch streams; and the slight elevation *en masse* which subjected the old shore-deposits to denudation has aided the tendency of the basin to retain transported sediment, which must accumulate yearly under present circumstances until the rivers that convey it find their way across the tract through channels traversing an alluvial plain."

So far geology on the origin of the Rann. Are we able from the condition and characters of the present flora of Pacham Island to derive any argument for or against the views expressed by geologists? If the island contained no endemic species, but were

characterized by species that do not occur in the countries immediately bordering on the Rann of Cutch, we would be obliged to admit that at one time the island formed part of a big continent, that, afterwards, its immediate surroundings were submerged, and that what is now Sind, Rajputana, Guzerat, and Cutch, was changed entirely by some cause or other. If endemic species were found amongst the members of the flora, we would be right in concluding that Pacham was not recently detached from a continent, but that, from the beginning, it was a true oceanic island, and that, after a long interval, the land began to rise and to form round Pacham Isle. Neither of the two conditions is fulfilled with regard to the biggest of the Rann islands. We did not notice a single species on Pacham, which we had not previously seen on the mainland. The fact that the whole aspect of the Pacham flora is quite different from that of any other part of Cutch examined by us is not due to specific differences in the composition of the vegetation but to differences in the combination and development of its members, in consequence of the special climatic and edaphic conditions prevailing on the island. Everybody, after crossing the grassy plain of the Ranni and the monotonous waste of the Rann, will be astonished to find, on a sudden, a comparatively rich vegetation. Fine shady trees greet the traveller in the lowlying belt of the island, and dense thickets of shrubs and climbers cover those parts that are not under cultivation. The prevalence of woody plants is the most striking feature of the flora. The mountain slopes look, from a distance, as if covered with dense forest, but, on closer inspection, the trees are losing a good deal of their size and beauty, and the whole forest now assumes the appearance of a more or less dense thicket of stunted trees and shrubs of a distinctly xerophytic character. The herbaceous vegetation is very scanty; only in crevices, where some soil has accumulated, nature has succeeded in producing a few poor species belonging chiefly to the *Gramineæ*, *Compositæ*, *Labiatæ*, and *Leguminosæ*.

It is evident that a flora with so few characteristic peculiarities in its aspect and with none as regards its composition, being merely a repetition of the vegetation of the mainland, cannot give any clue as to the origin of the Rann. We can easily explain how, under conditions similar to those of the present day, the whole flora of

Pacham Island may have developed in the course of a few centuries ; we have only to remember the different methods that are employed by plants for the purpose of seed-dispersal. If this be once admitted it is difficult to see how we shall measure geological times by the moments of a flora that may possibly be of yesterday.

